

CHAPTER 1

DRAINAGE REVIEW AND REQUIREMENTS



KING COUNTY, WASHINGTON

SURFACE WATER DESIGN MANUAL

Section 1.1	Drainage Review	1-3
Section 1.1.0	Projects Requiring Drainage Review	1-7
Section 1.1.2	Drainage Review Types and Requirements	1-8
Section 1.1.3	Drainage Review Required By Other Agencies	1-17
Section 1.1.4	Drainage Design Beyond Minimum Compliance	1-17
Section 1.2	Core Requirements	1-19
Section 1.2.1	Core Reqmt #1: Discharge at the Natural Location	1-19
Section 1.2.2	Core Reqmt #2: Offsite Analysis	1-21
Section 1.2.3	Core Reqmt #3: Flow Control	1-27
Section 1.2.4	Core Reqmt #4: Conveyance System	1-56
Section 1.2.5	Core Reqmt #5: Erosion and Sediment Control	1-61
Section 1.2.6	Core Reqmt #6: Maintenance and Operations	1-65
Section 1.2.7	Core Reqmt #7: Financial Guarantees and Liability	1-66
Section 1.2.8	Core Reqmt #8: Water Quality	1-68
Section 1.3	Special Requirements	1-85
Section 1.3.1	Special Reqmt #1: Other Adopted Area-Specific Requirements	1-85
Section 1.3.2	Special Reqmt #2: Floodplain/ Floodway Delineation	1-86
Section 1.3.3	Special Reqmt #3: Flood Protection Facilities	1-87
Section 1.3.4	Special Reqmt #4: Source Control	1-87
Section 1.3.5	Special Reqmt #5: Oil Control	1-88
Section 1.4	Adjustment Process	1-91
Section 1.4.1	Adjustment Authority	1-92
Section 1.4.2	Criteria for Granting Adjustments	1-92
Section 1.4.3	Adjustment Application Process	1-93
Section 1.4.4	Adjustment Review Process	1-93
Section 1.4.5	Appeal Procedure	1-94

CHAPTER 1

DRAINAGE REVIEW AND REQUIREMENTS

This chapter describes the drainage review procedures and types, the drainage requirements, and the adjustment procedures necessary to implement surface water runoff policies codified in Chapter 9.04 of the King County Code (KCC). It also provides direction for implementing more detailed procedures and design criteria found in subsequent chapters of this manual.

Chapter Organization

The information presented in Chapter 1 is organized into four main sections as follows:

- Section 1.1, "Drainage Review" (p. 1-3)
- Section 1.2, "Core Requirements" (p. 1-19)
- Section 1.3, "Special Requirements" (p. 1-85)
- Section 1.4, "Adjustment Process" (p. 1-91).

Each of these sections begins on an odd page so that tabs can be inserted by the user if desired for quicker reference.

Key Words and Phrases

Several key words and phrases have specific definitions as they are used in this manual; those of particular importance in determining drainage requirements are listed below. These and other terms are defined in the "Definitions" section in the back of this manual. Many of these terms are also defined when first used in this chapter.

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|--|--|
| • Acceptable discharge point | • Natural discharge area |
| • Closed depression | • New impervious surface |
| • Construct or modify | • Pollution-generating impervious surface |
| • Direct discharge | • Pollution-generating pervious surface |
| • Drainage area Native vegetated surface | • Project site |
| • Equivalent area New pervious surface | • Redevelopment project |
| • Existing site conditions | • Replaced impervious surface |
| • Flow durations Historic site conditions | • Single family residential project |
| • Flowpath | • Site (<i>see also onsite and offsite</i>) |
| • High-use site | • Surface-flow Transportation redevelopment project |
| • Hydraulically connected | • Threshold discharge area |

1.1 DRAINAGE REVIEW

Drainage review is the evaluation by the Department of Development and Environmental Services (DDES) permit review staff of a proposed project's compliance with the drainage requirements of this manual. During drainage review, DDES permit review staff also evaluate the proposed project for compliance with other King County requirements (which are not covered in this manual), such as those specified in the Sensitive Areas Ordinance, basin plans, and Critical Drainage Areas. If required, drainage review becomes an integral part of the overall permit review process. **This section describes when and what type of drainage review is required for a proposed project and how to determine which drainage requirements apply.**

Guide to Using Section 1.1

The following steps are recommended for efficient use of Section 1.1:

1. Determine whether your proposed project is subject to the requirements of this manual by seeing if it meets any of the thresholds for drainage review specified in Section 1.1.1 (p. 1-7). Making this determination requires an understanding of the key definitions listed below.
2. If drainage review is required per Section 1.1.1, use the flow chart in Figure 1.1.2.A (p. 1-9) to determine what type of drainage review will be conducted by DDES. The type of drainage review defines the scope of drainage requirements that will apply to your project as summarized in Table 1.1.2.A (p. 1-10).
3. Check the more detailed threshold information in Section 1.1.2 (beginning on page 1-8) to verify that you have determined the correct type of drainage review.
4. After verifying drainage review type, use the information in Section 1.1.2 to determine which core requirements (found in Section 1.2) and which special requirements (found in Section 1.3) must be evaluated for compliance by your project. To determine what actions are necessary to comply with each applicable core and special requirement, see the more detailed information on these requirements contained in Sections 1.2 and 1.3 of this chapter.

Note: For Steps 2 through 4, it is recommended that you arrange a predesign meeting with DDES permit review staff to confirm the type of drainage review and scope of drainage requirements that apply to your proposed project.

□ KEY DEFINITIONS

Proper application of the drainage review thresholds in this section requires an understanding of the key definitions listed below. Other definitions can be found in the "Definitions" section of this manual.

Construct or modify: To install a new drainage pipe/ditch or make improvements to an existing drainage pipe/ditch (for purposes other than routine maintenance, repair, or emergency modifications, and excluding driveway culverts installed as part of single family residential building permits) that either serves to concentrate previously unconcentrated surface and storm water runoff or serves to increase, decrease, and/or redirect the conveyance of surface and storm water runoff.

Critical Drainage Area: An area where the Department of Natural Resources (DNR) has determined that additional drainage controls (beyond those in this manual) are needed to address a severe flooding, drainage, and/or erosion condition which poses an imminent likelihood of harm to the welfare and safety of the surrounding community. Critical Drainage Areas (CDAs) are formally adopted by administrative rule under the procedures specified in KCC 2.98. When CDAs are adopted, they are inserted in Reference Section 3 of this manual and their requirements are implemented through Special Requirement #1 (see Section 1.3.1).

High-use site: A commercial or industrial site that (1) has an expected average daily traffic (ADT) count equal to or greater than 100 vehicles per 1,000 square feet of gross building area; (2) is subject to petroleum storage or transfer in excess of 1,500 gallons per year, not including delivered heating oil; or (3) is subject to use, storage, or maintenance of a fleet of 25 or more diesel vehicles that are over 10 tons net weight (trucks, buses, trains, heavy equipment, etc.). Also included is any road intersection with a measured ADT count of 25,000 vehicles or more on the main roadway and 15,000 vehicles or more on any intersecting roadway, excluding projects proposing primarily pedestrian or bicycle use improvements.

Land disturbing activity: Any activity that results in a change in the existing soil cover (both vegetative and nonvegetative) and/or the existing soil topography. Land disturbing activities include, but are not limited to demolition, construction, clearing, grading, filling, excavation, and compaction.

~~**Landslide Hazard Drainage Areas:**~~ [no longer needed for drainage review determination]

Maintenance: Those usual activities that (1) are conducted on currently serviceable structures, facilities, and equipment; (2) involve no expansion of or change in use of such structures, facilities, and equipment beyond those that existed previously; and (3) do not result in significant hydrological impact. Maintenance includes those usual activities taken to prevent a decline, lapse, or cessation in the use of structures and systems and includes replacement of dysfunctioning facilities. Maintenance also includes the replacement of existing structures with different types of structures, provided that such replacement is required to meet current engineering standards or by one or more environmental permits and the functioning characteristics of the original structure are not changed. An example would be replacing a collapsed, fish-passage blocking, corrugated metal pipe culvert with a new, concrete bottomless box culvert under the same span or width of driveway.

Native vegetated surface: A surface in which the soil conditions, ground cover, and species of vegetation are like those of the original native condition for the site. More specifically, this means (1) the soil is either undisturbed or has been treated according to the "native vegetated landscape" specifications in Section 5.3.x, (2) the ground is either naturally covered with vegetation litter or has been top-dressed with 6 inches of hog fuel consistent with the native vegetated landscape specifications in Section 5.3.x, and (3) the vegetation is either (a) comprised predominantly of plant species, other than noxious weeds, which are indigenous to the coastal region of the Pacific Northwest and which reasonably could have been expected to naturally occur on the site, or (b) comprised of plant species as specified for a native vegetated landscape in Section 5.3.x. Examples of plant species include trees such as Douglas fir, western hemlock, western red cedar, alder, big-leaf maple and vine maple; shrubs such as willow, elderberry, salmonberry and salal; and herbaceous plants such as sword fern, foam flower, and fireweed.

Natural discharge area: An onsite area tributary to a single natural discharge location.

Natural discharge location: The location where runoff leaves the project site under existing site conditions.

New impervious surface: The addition of a hard or compacted surface such as roofs, pavement, gravel, or dirt, or the addition of a more compacted surface such as the paving of pre-existing dirt or gravel. New impervious surface also includes any previous addition of hard or compacted surface since January 8, 2001 that was not mitigated to, or was below the thresholds of, the flow control standards in effect at the time the surface was vested to be added. Note: January 8, 2001 is the effective date of the ESA 4(d) Rule for Puget Sound Chinook Salmon.

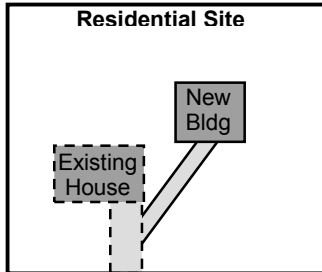
New pervious surface: The conversion of native vegetated surface to pasture or other non-native pervious surface (e.g., lawns, landscaping, bare soil, etc.), or the conversion of pasture to other non-native pervious surface. New pervious surface also includes any previous conversion of native vegetated surface since January 8, 2001 that was not mitigated to, or was below the thresholds of, the flow control standards in effect at the time the surface was vested to be converted.

~~**Pollution-generating impervious surface (PGIS):**~~ [no longer needed for drainage review determination]

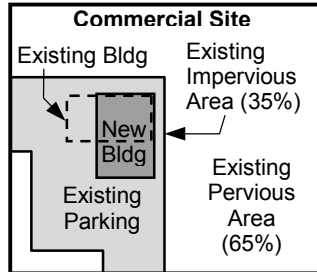
Project site: That portion of a property or properties subject to proposed project improvements including those required by this manual.

Redevelopment project: A project that proposes to add, replace, ~~and/or alter or modify~~ impervious ~~or pervious~~ surfaces (for purposes other than ~~a residential subdivision or~~ routine maintenance, resurfacing, regrading, or repair) on a site that is already substantially developed ~~as currently zoned or designated or as a legal non-conforming use (for example, a residential-zoned parcel that contains an existing residence or other allowed structure or uses) or (i.e., has an 35% or more of~~ existing impervious surface coverage ~~of 35% or more~~). The following examples illustrate the application of this definition.

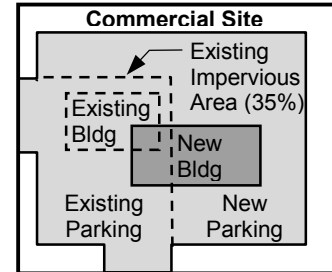
A Redevelopment Project that Adds New Impervious Surface



A Redevelopment Project that Replaces Impervious Surface



A Redev Project that Adds and Replaces Impervious Surface



Replaced impervious surface: Any existing impervious surface on the project site that is proposed to be removed ~~down to bare soil or base course~~ and ~~replaced re-established as with pollution-generating~~ impervious surface, excluding impervious surface removed for the sole purpose of installing utilities ~~or performing maintenance~~. *Removed* means the removal of buildings down to bare soil or the removal of Portland cement concrete (PCC) slabs and pavement or asphaltic concrete (AC) pavement together with any asphalt treated base (ATB). It does not include the removal of pavement material through grinding or other surface modification unless the entire layer of PCC or AC together with ATB is removed.

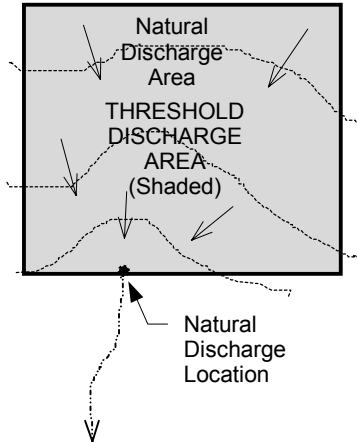
Single family residential project: Any project that (a) constructs or modifies a single family dwelling unit, (b) ~~and/or~~ makes ~~related onsite~~ improvements (e.g., ~~such as~~ driveways, roads, outbuildings, play courts, etc.) or clears native vegetation on a lot that contains or will contain a single family dwelling unit, or a project that (c) is a plat or short plat which creates lots that will contain single family ~~residential~~ ~~lots~~ dwelling units ~~such as plat or short plat~~.

Site (a.k.a. development site): The legal boundaries of the parcel or parcels of land for which an applicant has or should have applied for authority from King County to carry out a development activity, including any drainage improvements required by this manual.

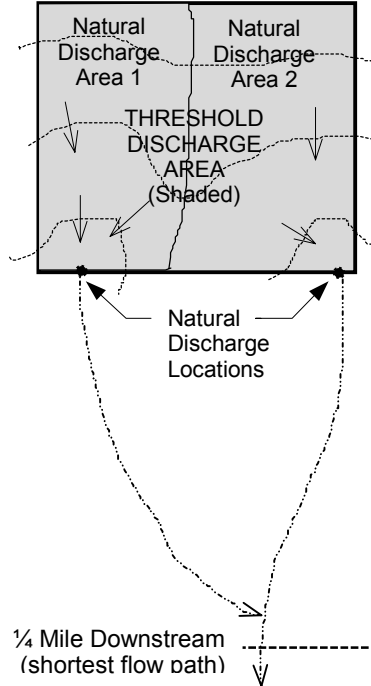
Transportation Redevelopment Project: A project that makes improvements (excluding maintenance) only to or for existing roads within public or private road rights-of-way and that meets the definition of a redevelopment project.

Threshold discharge area: An onsite area draining to a single natural discharge location or multiple natural discharge locations that combine within one-quarter-mile downstream (as determined by the shortest flowpath). The examples below illustrate this definition. The purpose of this definition is to clarify how the thresholds of this manual are applied to project sites with multiple discharge points.

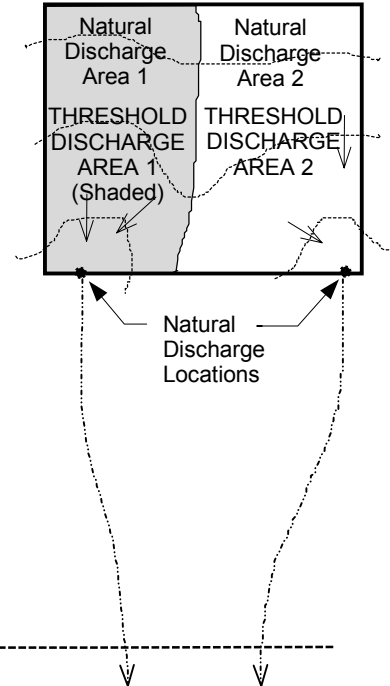
Example of a Project Site with a Single Natural Discharge and a Single Threshold Discharge Area



Example of a Project Site with Multiple Natural Discharges and a Single Threshold Discharge Area



Example of a Project Site with Multiple Natural Discharges and Multiple Threshold Discharge Areas



1.1.1 PROJECTS REQUIRING DRAINAGE REVIEW

Drainage review is required for any proposed project (except those proposing only ~~routine maintenance, repair, or emergency modifications~~) that is subject to a King County development proposal, permit, or approval listed at right, AND which meets any one of the following conditions:

1. The project adds or will result in Adds 52,000 square feet¹ or more of new impervious surface, OR
2. The project adds or will result in 500 square feet¹ or more of new impervious surface on a rural residential zoned parcel, OR
3. The project proposes 7,000 square feet¹ or more of land disturbing activity, OR
- 2-4. The project Pp proposes to **construct or modify** a drainage pipe/ditch that is 12 inches or more in size/depth, or receives surface and storm water runoff from a drainage pipe/ditch that is 12 inches or more in size/depth, OR
- 3-5. The project Cc contains or is adjacent to a floodplain, stream, lake, wetland, closed depression, or other **sensitive area** as defined by the Sensitive Areas Ordinance (codified in KCC 21A.24), excluding seismic, coal mining, and volcanic hazard areas, OR
- 5-Is located within a ~~Landslide Hazard Drainage Area~~² and adds 2,000 square feet or more of new impervious surface, OR
- 7-6. The project H is located within a **Critical Drainage Area**,³ OR
- 6-Is located within a ~~rural zoned area~~ subject to areal clearing limits⁴ under KCC 16.82.150(e) and clears more than 7,000 square feet or 35% of the site, whichever is greater, OR
7. The project H is a **redevelopment project** proposing \$100,000⁵ or more of improvements to an existing **high-use site**, OR
8. The project is a transportation redevelopment project in which new impervious surface is 5,000 square feet or more and totals 50% or more of the existing impervious surface within the project limits⁶, OR
- 8-9. The project H is a **redevelopment project (excluding transportation redevelopment projects) in which the total of new plus replaced impervious surface is proposing \$500,000 or more of site**

King County Permits and Approvals

Administrative Subdivision (Short Plat)
 Conditional Use*
 Clearing
 Commercial Building
 Experimental Design Adjustment*
 Formal Subdivision (plat)
 Franchise Utility Right-of-Way Use
 Grading
 Preapplication Adjustment*
 Right-of-Way Use
 Shoreline Substantial Development*
 Single Family Residential Building
 Special Use*
 Unclassified Use*
 Urban Planned Development
 Zoning Reclassification*
 Zoning Variance*

**Note: If the proposed project will require subsequent permits subject to drainage review, then DDES may allow the drainage review to be deferred until application for the later permits.*

¹ The thresholds ~~for 5,000 square feet or more of new impervious surface and land disturbing activity~~ shall be applied by **threshold discharge area** and **in accordance with the definitions of these surfaces and activities** shall include all impervious surface that will ultimately result from the proposed project (e.g., impervious surface that will result from future homes within a plat or short plat).

² ~~Landslide Hazard Drainage Areas are delineated on a map adopted with this manual (see map pocket inside of back cover).~~

³ See Reference Section 3 for a list of Critical Drainage Areas.

⁴ ~~See Reference Section 1 for a list of rural zoned areas where this threshold applies.~~

⁵ This is the "project valuation" as declared on the permit application submitted to DDES. The cost thresholds in this manual are considered to be in 1998 dollars and may be adjusted on an annual basis using the local consumer price index (CPI).

⁶ Project limits encompass the entire width of right-of-way within the total length of right-of-way subject to improvements proposed by the transportation redevelopment project.

~~improvements and creates 5,000 square feet or more and whose valuation of proposed improvements (including interior improvements and excluding required mitigation improvements) exceeds 50% of the assessed value of the existing site improvements of contiguous⁷ pollution-generating impervious surface through any combination of new and/or replaced impervious surface.~~

If drainage review is required for the proposed project, the type of drainage review must be determined based on project and site characteristics as described in Section 1.1.2. The type of drainage review defines the scope of drainage requirements which must be evaluated for project compliance with this manual.

1.1.2 DRAINAGE REVIEW TYPES AND REQUIREMENTS

For most projects adding 5,000 square feet or more of impervious surface, the full range of core and special requirements contained in Sections 1.2 and 1.3 must be evaluated for compliance through the drainage review process. However, for some types of projects the scope of requirements applied is narrowed to allow more efficient, customized review. Each of the following four drainage review types tailors the review process and application of drainage requirements to a project's size, location, type of development, and anticipated impacts to the local and regional surface water system:

- Small Site Drainage Review, Section 1.1.2.1 (p. 1-11)
- Targeted Drainage Review, Section 1.1.2.2 (p. 1-12)
- Full Drainage Review, Section 1.1.2.3 (p. 1-15)
- Large Site Drainage Review, Section 1.1.2.4 (p. 1-16).

Each project requires only one of the above drainage review types, with the single exception that a project which qualifies for Small Site Drainage Review may also require Targeted Drainage Review. Figure 1.1.2.A can be used to determine which drainage review type would be required. This may entail consulting the more detailed thresholds for each review type specified in the above-referenced sections.

Table 1.1.2.A (next page) can be used to quickly identify which requirements are applied under each type of drainage review. The applicant must evaluate those requirements that are checked off for a particular drainage review type to determine what is necessary to meet compliance.

⁷ *Contiguous* pollution-generating impervious surface (PGIS) means a discrete patch of PGIS that is all together as opposed to being separated in different locations on the project site. The intent is to identify those redevelopment projects that are replacing and/or adding enough impervious surface in one location to allow for opportune installation of a water quality treatment facility. The threshold of 5,000 square feet or more of contiguous PGIS shall be applied by **threshold discharge area**.

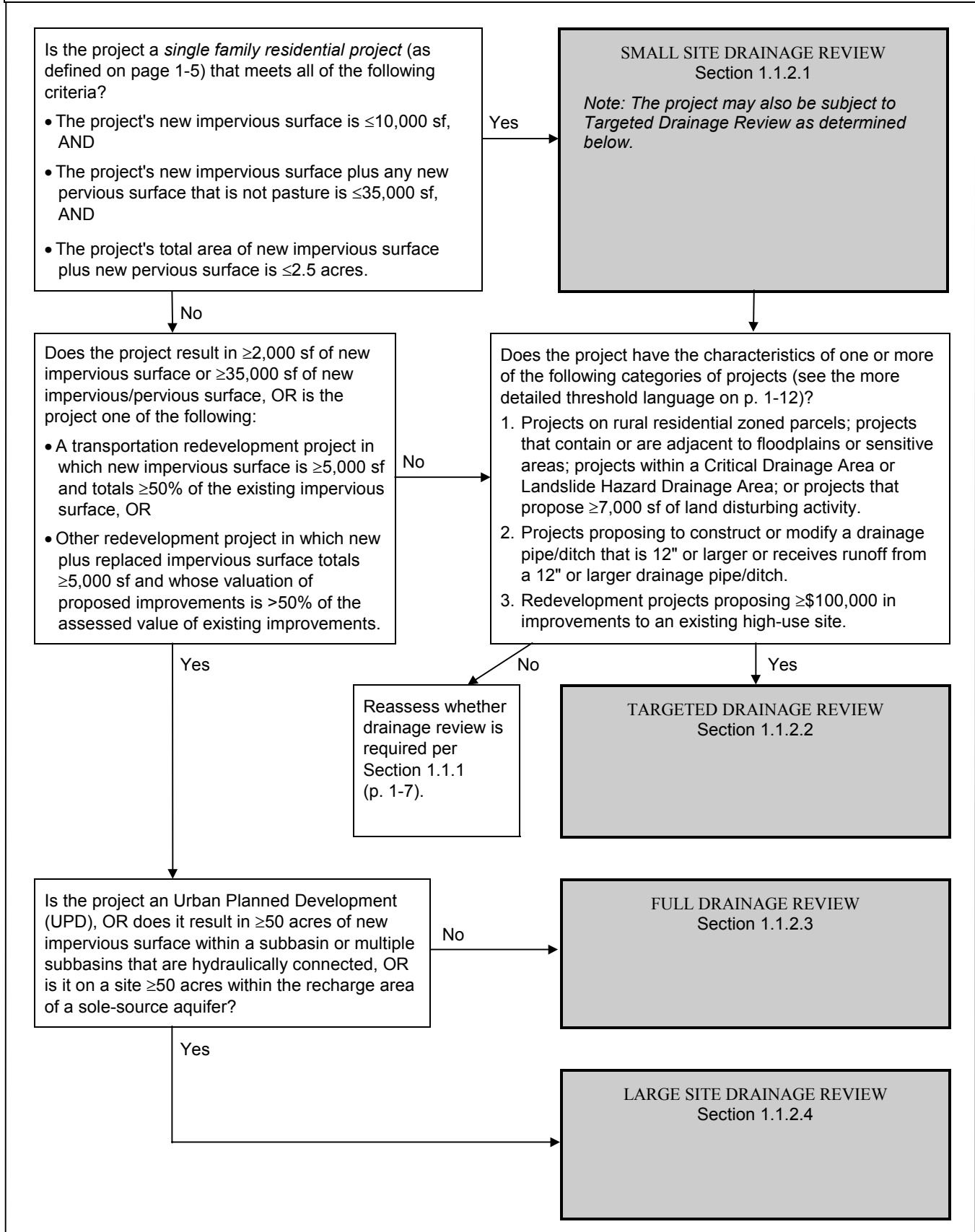
FIGURE 1.1.2.A FLOW CHART FOR DETERMINING TYPE OF DRAINAGE REVIEW REQUIRED

TABLE 1.1.2.A REQUIREMENTS APPLIED UNDER EACH DRAINAGE REVIEW TYPE

	Small Site Drainage Review	Targeted Drainage Review			Full Drainage Review	Large Site Drainage Review
	Single family residential projects which result in $\leq 10,000$ sf of new impervious surface, AND $\leq 35,000$ sf of new impervious surface plus new pervious surface that is not pasture, AND ≤ 2.5 acres of total new impervious surface plus new pervious surface.	Projects that are not subject to Full or Large Site Drainage Review as determined in Sections 1.1.2.3 (p. 1-15) and 1.1.2.4 (p. 1-16), AND which have the characteristics of one or more of the following categories of projects: 1. Projects on rural residential zoned parcels; projects containing or adjacent to floodplains/sensitive areas; projects within a Critical Drainage Area or Landslide Hazard Drainage Area; or projects proposing $\geq 7,000$ sf of land disturbing activity. 2. Projects proposing to construct or modify a drainage pipe/ditch that is 12" or larger or receives runoff from a 12" or larger drainage pipe/ditch. 3. Redevelopment projects proposing $\geq \$100,000$ in improvements to a high-use site ⁽¹⁾			All projects which result in $\geq 2,000$ sf of new impervious surface or $\geq 35,000$ sf of new impervious plus new pervious surface but which do not qualify for Small Site Drainage Review, OR redevelopment projects meeting drainage review thresholds 10 and 11 in Section 1.1.1 (p. 1-7).	UPDs, OR projects that result in ≥ 50 acres of new impervious surface within a subbasin or multiple subbasins that are hydraulically connected, OR projects on sites ≥ 50 acres within the recharge area of a sole-source aquifer.
		Category 1	Category 2	Category 3		
SMALL SITE REQUIREMENTS	✓					
CORE REQUIREMENT #1 Discharge at Natural Location		* ⁽²⁾	✓		✓	✓
CORE REQUIREMENT #2 Offsite Analysis		* ⁽²⁾	✓ ⁽³⁾		✓ ⁽³⁾	✓ ⁽³⁾
CORE REQUIREMENT #3 Flow Control		* ⁽²⁾			✓ ⁽³⁾	✓ ⁽³⁾
CORE REQUIREMENT #4 Conveyance System		* ⁽²⁾	✓		✓	✓
CORE REQUIREMENT #5 Erosion & Sediment Control		✓	✓	✓	✓	✓
CORE REQUIREMENT #6 Maintenance & Operations		* ⁽²⁾	✓	✓	✓	✓
CORE REQUIREMENT #7 Financial Guarantees & Liability		* ⁽²⁾	✓ ⁽³⁾	✓ ⁽³⁾	✓ ⁽³⁾	✓ ⁽³⁾
CORE REQUIREMENT #8 Water Quality		* ⁽²⁾			✓ ⁽³⁾	✓ ⁽³⁾
SPECIAL REQUIREMENT #1 Other Adopted Requirements		✓ ⁽³⁾			✓ ⁽³⁾	✓ ⁽³⁾
SPECIAL REQUIREMENT #2 Floodpln/Floodwy Delineation		✓ ⁽³⁾			✓ ⁽³⁾	✓ ⁽³⁾
SPECIAL REQUIREMENT #3 Flood Protection Facilities		✓ ⁽³⁾			✓ ⁽³⁾	✓ ⁽³⁾
SPECIAL REQUIREMENT #4 Source Control		✓ ⁽³⁾	✓ ⁽³⁾	✓ ⁽³⁾	✓ ⁽³⁾	✓ ⁽³⁾
SPECIAL REQUIREMENT #5 Oil Control				✓ ⁽³⁾	✓ ⁽³⁾	✓ ⁽³⁾
⁽¹⁾ Category 3 projects that install oil controls which construct or modify a 12-inch pipe/ditch are also Category 2 projects. ⁽²⁾ May be applied by DDES based on project or site-specific conditions. ⁽³⁾ These requirements have exemptions or thresholds which may preclude or limit their application to a specific project.						

1.1.2.1 SMALL SITE DRAINAGE REVIEW

Small Site Drainage Review is a simplified alternative to Full Drainage Review for small residential building clearing, and subdivision projects adding less than 10,000 square feet of new impervious surface and restricting site clearing to less than 2 acres or less than 35% of the site, whichever is greater. The core and special requirements applied under Full Drainage Review are replaced with simplified small site requirements which can be applied by a non-engineer. These requirements include flow control Best Management Practices (BMPs) such as setting aside open space to limit future site clearing, and using simple measures such as splash blocks and gravel trenches to disperse or infiltrate runoff from impervious areas. Also included are simple BMPs for erosion and sediment control (ESC). Formal water quality treatment is not necessary. This alternative to Full Drainage Review acknowledges that drainage impacts for many small development project proposals can be effectively mitigated without construction of costly flow control and water quality facilities.

The Small Site Drainage Review process minimizes the time and effort required to design, submit, review, and approve drainage facilities for these proposals. In most cases, the requirements can be met with submittals prepared by contractors, architects, or homeowners without the involvement of a licensed civil engineer.

Threshold

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Small Site Drainage Review is allowed for any single family residential project⁸ that is subject to drainage review as determined in Section 1.1.1 (p. 1-7) and that meets all of the following criteria:

- The project adds or will result in no more than 10,000 square feet⁹ of **new impervious surface, is a single family residential project**,⁸ -AND
- The project ~~adds 2,000 to 10,000 square feet~~⁹ of ~~new impervious surface~~ adds or will result in no more than 35,000 square feet of area comprised of new impervious surface plus any new pervious surface that is not pasture, AND
- The project ~~clears~~ adds or will result in no more than 2.5 acres of total area comprised of new impervious surface plus new pervious surface ~~less than 2 acres or less than 35% of the site, whichever is greater.~~

Note: Some projects qualifying for Small Site Drainage Review may also require Targeted Drainage Review if they meet any of the threshold criteria in Section 1.1.2.2 (p. 1-12).

Any ~~potential~~ small site proposal may elect to go through Full Drainage Review described in Section 1.1.2.3 (p. 1-15).

Scope of Requirements

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If Small Site Drainage Review is allowed, THEN the applicant may apply the simplified small site submittal and drainage design requirements detailed in *Small Site Drainage Requirements* adopted as Appendix C to this manual (detached) and available as a separate booklet from DNR or DDES. These requirements include simplified BMPs for flow control and erosion and sediment control. *Note: An open space tract or covenant may be required to preserve uncleared areas.*

Exemption from Core and Special Requirements

The simplified drainage requirements applied under Small Site Drainage Review are considered sufficient to meet the overall intent of the core and special requirements in Sections 1.2 and 1.3, except under certain conditions when a proposed project has characteristics that trigger Targeted Drainage Review (see the threshold for Targeted Drainage Review in Section 1.1.2.2, p. 1-12) and may require the involvement of a licensed civil engineer. Therefore, any proposed project that qualifies for Small Site Drainage Review as determined above and complies with the small site drainage requirements detailed in Appendix C is

⁸ *Single family residential project* is defined on page 1-5.

⁹ The thresholds of 10,000 square feet, 35,000 square feet, and 2.5 acres of new impervious surface shall be applied by **threshold discharge area** and in accordance with the definitions of these surfaces ~~shall include all impervious surface that will ultimately result from the proposed project (e.g., impervious surface that will result from future homes within a plat or short plat).~~

considered exempt from all core and special requirements in Sections 1.2 and 1.3 **except** those which would apply to the project if it is subject to Targeted Drainage Review as specified in Section 1.1.2.2 (p. 1-12).

1.1.2.2 TARGETED DRAINAGE REVIEW

Targeted Drainage Review (TDR) is an abbreviated evaluation by DDES permit review staff of a proposed project's compliance with selected core and special requirements. Projects subject to this type of drainage review are typically small-site proposals or other small projects that have site-specific or project-specific drainage concerns that must be addressed by a licensed civil engineer or DDES engineering review staff. Under Targeted Drainage Review, engineering costs associated with drainage design and review are kept to a minimum because the review includes only those requirements that would apply to the particular project.

Threshold

Targeted Drainage Review is required for those projects subject to drainage review as determined in Section 1.1.1 (p. 1-7), AND which are not subject to Full or Large Site Drainage Review as determined in Sections 1.1.2.3 (p. 1-15) and 1.1.2.4 (p. 1-16), AND which have the characteristics of one or more of the following project categories:

- **TDR Project Category #1:** Projects on rural residential zoned parcels, OR projects that contain or are adjacent to a floodplain, stream, lake, wetland, closed depression, or other **sensitive area** as defined by the Sensitive Areas Ordinance (codified in KCC 21A.24) excluding seismic, coal mining, and volcanic hazard areas; OR projects located within a Critical Drainage Area¹⁰ or Landslide Hazard Drainage Area¹¹; OR projects that propose located within a rural zoned area¹² subject to areal clearing limits under KCC 16.82.150(c) and which clear more than 7,000 square feet or more of land disturbing activity 35% of the site, whichever is greater.
- **TDR Project Category #2:** Projects that propose to *construct or modify*¹³ a drainage pipe/ditch that is 12 inches or more in size/depth or receives surface and storm water runoff from a drainage pipe/ditch that is 12 inches or more in size/depth.
- **TDR Project Category #3:** Redevelopment projects that propose \$100,000 or more of improvements to an existing *high-use site*.¹⁴

Scope of Requirements

IF Targeted Drainage Review is required, THEN the applicant must demonstrate that the proposed project complies with the selected core and special requirements corresponding to the project category or categories that best match the proposed project. The project categories and applicable requirements for each are described below and summarized in Table 1.1.2.A (p. 1-10).

Note: If the proposed project has the characteristics of more than one project category, the requirements of each applicable category shall apply.

Compliance with these requirements requires submittal of engineering plans and/or calculations stamped by a licensed civil engineer registered in the state of Washington, unless deemed unnecessary by DDES. The engineer need only demonstrate compliance with those core and special requirements that have been predetermined to be applicable based on specific project characteristics as detailed below and summarized in Table 1.1.2.A (p. 1-10). The procedures and requirements for submittal of engineering plans and calculations can be found in Section 2.3.

¹⁰ See Reference Section 3 for a list of Critical Drainage Areas.

¹¹ Landslide Hazard Drainage Areas are delineated on a map adopted with this manual (see map pocket inside of back cover).

¹² See Reference Section 1 for a list of rural zoned areas where this threshold applies.

¹³ *Construct and modify* is defined on page 1-3.

¹⁴ See the full definition of high-use site on page 1-14.

TDR Project Category #1

This category includes projects that are too small to trigger application of most core requirements, but may be subject to site-specific floodplain or sensitive area requirements, or other area-specific drainage requirements adopted by the County. Such projects primarily include single family residential projects in Small Site Drainage Review.

REQUIREMENTS

IF the proposed project meets the characteristics of TDR Project Category #1, THEN the applicant must demonstrate that the project complies with the following five requirements:

- Core Requirement #5: Erosion and Sediment Control, Section 1.2.5 (p. 1-61)
- Special Requirement #1: Other Adopted Area-Specific Requirements, Section 1.3.1 (p. 1-85)
- Special Requirement #2: Floodplain/Floodway Analysis, Section 1.3.2 (p. 1-86)
- Special Requirement #3: Flood Protection Facilities, Section 1.3.3 (p. 1-87)
- Special Requirement #4: Source Control, Section 1.3.4 (p. 1-87).

In addition, **DDES may require** the applicant to demonstrate compliance with any one or more of the **remaining seven core requirements** in Section 1.2 based on project or site-specific conditions. For example, if the proposed project contains or is adjacent to a SAO-defined landslide or steep slope hazard area, DDES may require compliance with "Core Requirement #1: Discharge at the Natural Location" (Section 1.2.1, p. 1-19). This may in turn require compliance with "Core Requirement #2: Offsite Analysis" (Section 1.2.2, p. 1-21) if a tightline is required by Core Requirement #1. If a tightline is found to be unfeasible, DDES may instead require a flow control facility per "Core Requirement #3: Flow Control" (Section 1.2.3, p. 1-27). If a tightline is feasible, "Core Requirement #4: Conveyance System" (Section 1.2.4, p. 1-56) would be required to ensure proper size and design. Any required flow control facility or tightline system may also trigger compliance with "Core Requirement #6: Maintenance and Operations" (Section 1.2.6, p. 1-65), "Core Requirement #7: Financial Guarantees and Liability" (Section 1.2.7, p. 1-66), and possibly "Core Requirement #8, Water Quality" (Section 1.2.8, p. 1-68) if runoff from pollution-generating impervious surfaces is collected.

The applicant may also have to address compliance with any applicable sensitive areas requirements in KCC 21A.24 as determined by DDES.

TDR Project Category #2

This category is intended to apply selected core and special requirements to those projects that propose to construct or modify a drainage system of specified size, but are not adding sufficient impervious surface to trigger Full Drainage Review or Large Site Drainage Review.

REQUIREMENTS

IF the proposed project meets the characteristics of TDR Project Category #2, THEN the applicant must demonstrate that the proposed project complies with the following requirements:

- Core Requirement #1: Discharge at the Natural Location, Section 1.2.1 (p. 1-19)
- Core Requirement #2: Offsite Analysis, Section 1.2.2 (p. 1-21)
- Core Requirement #4: Conveyance System, Section 1.2.4 (p. 1-56)
- Core Requirement #5: Erosion and Sediment Control, Section 1.2.5 (p. 1-61)
- Core Requirement #6: Maintenance and Operations, Section 1.2.6 (p. 1-65)
- Core Requirement #7: Financial Guarantees and Liability, Section 1.2.7 (p. 1-66)
- Special Requirement #4: Source Control, Section 1.3.4 (p. 1-87).

TDR Project Category #3

This category is intended to improve water quality by applying source control and oil control requirements to redevelopment projects located on the most intensively used sites developed prior to current water quality requirements. These are referred to as *high-use sites* and are defined below.

High-Use Site Definition: A *high-use site* is any one of the following:

- A commercial or industrial site with an expected average daily traffic (ADT) count equal to or greater than 100 vehicles per 1,000 square feet of gross building area, OR
- A commercial or industrial site subject to petroleum storage or transfer in excess of 1,500 gallons per year, not including delivered heating oil, OR
- A commercial or industrial site subject to use, storage, or maintenance of a fleet of 25 or more diesel vehicles that are over 10 tons net weight (e.g., trucks, buses, trains, heavy equipment, etc.), OR
- A road intersection with a measured ADT count of 25,000 vehicles or more on the main roadway and 15,000 vehicles or more on any intersecting roadway, excluding projects proposing primarily pedestrian or bicycle use improvements.

REQUIREMENTS IF the proposed project meets the characteristics of TDR Project Category #3, THEN the applicant must demonstrate that the proposed project complies with the following requirements:

- Core Requirement #5: Erosion and Sediment Control, Section 1.2.5 (p. 1-61)
- Core Requirement #6: Maintenance and Operations, Section 1.2.6 (p. 1-65)
- Core Requirement #7: Financial Guarantees and Liability, Section 1.2.7 (p. 1-66)
- Special Requirement #4: Source Control, Section 1.3.4 (p. 1-87)
- Special Requirement #5: Oil Control, Section 1.3.5 (p. 1-88).

Note: In some cases, DDES may determine that application of these requirements does not require submittal of engineering plans and calculations stamped by a licensed civil engineer. For example, if catch basin inserts are proposed to meet oil control requirements, engineered plans and calculations may not be necessary. A plot plan showing catch basin locations may suffice.

1.1.2.3 FULL DRAINAGE REVIEW

Full Drainage Review is the evaluation by DDES permit review staff of a proposed project's compliance with the full range of core and special requirements in this chapter. This review addresses the impacts associated with adding new impervious surface and changing land cover on typical sites.

Threshold

Full Drainage Review is required for any proposed projects, including redevelopment projects, that are subject to drainage review as determined in Section 1.1.1 (p. 1-7), AND which meet one or more of the following criteria:

- Projects which add or will result in 52,000 square feet¹⁵ or more of new impervious surface but which do not qualify for Small Site Drainage Review as specified in Section 1.1.2.1 (p. 1-11), OR
- ~~Projects located within a Landslide Hazard Drainage Area¹⁶ which add 2,000 square feet or more of new impervious surface but which do not qualify for Small Site Drainage Review per Section 1.1.2.1, OR~~
- Projects which add or will result in 35,000 square feet¹⁷ or more of new impervious surface plus new pervious surface but which do not qualify for Small Site Drainage Review per Section 1.1.2.1, OR
- Transportation redevelopment projects in which new impervious surface is 5,000 square feet¹⁸ or more and totals 50% or more of the existing impervious surface within the project limits¹⁹, OR
- Redevelopment projects (excluding transportation redevelopment projects) in which the total of new plus replaced²⁰ impervious surface is proposing \$500,000 or more of site improvements which create 5,000 square feet²¹ or more and whose valuation of proposed improvements (including interior improvements and excluding required mitigation improvements) exceeds 50% of the assessed value of the existing site improvements of contiguous pollution-generating impervious surface²² through any combination of new and/or replaced impervious surface.²³

Scope of Requirements

IF Full Drainage Review is required, THEN the applicant must demonstrate that the proposed project complies with the following requirements:

- All eight core requirements in Section 1.2
- All five special requirements in Section 1.3

Engineering plans and calculations stamped by a licensed civil engineer registered in the state of Washington must be submitted to demonstrate compliance with these requirements. The procedures and requirements for submittal of engineering plans and calculations can be found in Section 2.3.

¹⁵ The threshold of 52,000 square feet or more of new impervious surface shall be applied by **threshold discharge area** and in accordance with the definition of new impervious surface on page 1-4 ~~shall include all impervious surface that will ultimately result from the proposed project (e.g., impervious surface that will result from future homes within a plat or short plat).~~

¹⁶ ~~Landslide Hazard Drainage Areas are delineated on a map adopted with this manual (see map pocket inside of back cover).~~

¹⁷ The threshold of 35,000 square feet or more of new pervious surface shall be applied by threshold discharge area and in accordance with the definition of new pervious surface on page 1-4.

¹⁸ This threshold of 5,000 square feet of new impervious surface shall be applied by the area within the project limits.

¹⁹ Project limits encompass the entire width of right-of-way within the total length of right-of-way subject to improvements proposed by the transportation redevelopment project.

²⁰ Replaced impervious surface is defined on page 1-5.

²¹ This threshold of 5,000 square feet or more of new plus replaced impervious surface shall be applied by threshold discharge area and in accordance with the definitions for these surfaces.

²² Pollution-generating impervious surface (PGIS) is partially defined on...

²³ Replaced impervious surface is defined on page 1-5.

1.1.2.4 LARGE SITE DRAINAGE REVIEW

Large Site Drainage Review is applied to development proposals that are large and/or involve resources or problems of special sensitivity or complexity. Because of the large size and complexities involved, there is usually a greater risk of significant impact or irreparable damage to sensitive resources. Such proposals often require a more definitive approach to drainage requirements than that prescribed by the core and special requirements in Sections 1.2 and 1.3; it may be appropriate to collect additional information about site resources, use more sophisticated models, and prepare special studies not specified in this manual. Large Site Drainage Review entails preparation of a master drainage plan (MDP) or limited scope MDP which is reviewed and approved by DDES.

Threshold

Large Site Drainage Review is required for any proposed project that is subject to drainage review as determined in Section 1.1.1 (p. 1-7), AND that meets any one of the following criteria:

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- The project is designated for an Urban Planned Development (UPD) on the King County Comprehensive Plan Land Use Map, OR
- The project would, at full buildout, result in 50 acres or more of new impervious surface within a single subbasin or multiple subbasins that are *hydraulically connected*²⁴ across subbasin boundaries, OR
- The project is on a site of 50 acres or more (including open space, sensitive areas, and growth reserve) within the recharge area of a sole-source aquifer as designated by the EPA and depicted as such on the Areas Highly Susceptible to Groundwater Contamination Map adopted as part of the King County Comprehensive Plan.

Scope of Requirements

IF Large Site Drainage Review is required, THEN the applicant must do the following:

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1. Prepare a master drainage plan (MDP), limited scope MDP, or special study in accordance with the process and requirements described in the MDP guidelines, *Master Drainage Planning for Large or Complex Site Developments*, available from DNR or DDES. The MDP or special study shall be completed, or a schedule for completion identified and agreed to by DDES, prior to permit approval. *Note: Generally, it is most efficient for the MDP process to parallel the State Environmental Policy Act (SEPA) process.*
2. Demonstrate that the proposed project complies with all the core and special requirements in Sections 1.2 and 1.3, with some potential modifications as follows:
 - Core Requirement #2, Offsite Analysis, is typically modified during MDP scoping.
 - Core Requirement #3, Flow Control, may be modified to require more sophisticated hydrologic modeling.
 - Core Requirement #5, ESC, may be modified to require enhanced construction monitoring.
 - Core Requirement #7, Financial Guarantees and Liability, may be modified to implement a monitoring fund.
 - Core Requirement #8, Water Quality, may be modified to require the water quality Resource Stream Protection menu in areas where additional fisheries protection is needed and experimental facilities may be pursued without additional adjustments.
 - Special pre- and post-development monitoring may also be required if deemed necessary by DDES to adequately characterize sensitive site and downstream resources, and to ensure that onsite drainage controls and mitigation measures are effective in protecting sensitive or critical resources. Detailed guidelines for monitoring are appended to the MDP guidelines referenced above.

²⁴ *Hydraulically connected* means connected through surface flow or water features such as wetlands or lakes.

1.1.3 DRAINAGE REVIEW REQUIRED BY OTHER AGENCIES

Drainage review for a proposed project's impact on surface and storm waters may be addressed by processes or requirements apart from King County's. Agencies such as those listed below may require some form of drainage review and impose drainage requirements that are separate from and in addition to King County's drainage requirements. The applicant is responsible for coordinating with these agencies and resolving any conflicts in drainage requirements. *Note: King County is required to advise the Muckleshoot Indian Tribe of development proposals affecting certain sensitive areas or water bodies bearing anadromous fish.*

Agency	Permit/Approval
Seattle/King County Department of Public Health	Onsite Sewage Disposal and Well permits
Washington State	
Department of Transportation	Developer/Local Agency Agreement
Department of Fish and Wildlife	Hydraulic Project Approval
Department of Ecology	Short Term Water Quality Modification Approval
	Dam Safety permit
	NPDES Stormwater permit
Department of Natural Resources	Forest Practices Class IV permit
United States Army Corps of Engineers	Sections 10, 401, and 404 permits

1.1.4 DRAINAGE DESIGN BEYOND MINIMUM COMPLIANCE

This manual presents King County's minimum standards for engineering and design of drainage facilities. While the County believes these standards are appropriate for a wide range of development proposals, compliance solely with these requirements does not relieve the professional engineer submitting designs of his or her responsibility to ensure drainage facilities are engineered to provide adequate protection for natural resources and public and private property.

Compliance with the standards in this manual does not necessarily mitigate all probable and significant environmental impacts to aquatic biota. Fishery resources and other living components of aquatic systems are affected by a complex set of factors. While employing a specific flow control standard may prevent stream channel erosion or instability, other factors affecting fish and other biotic resources (such as increases in stream flow velocities) are not directly addressed by this manual. Likewise, some wetlands, including bogs, are adapted to a very constant hydrological regime. Even the most stringent flow control standard employed by this manual does not prevent increases in runoff volume which can adversely affect wetland plant communities by increasing the duration and magnitude of water level fluctuations. Thus, compliance with this manual should not be construed as mitigating all probable and significant stormwater impacts to aquatic biota in streams and wetlands, and additional mitigation may be required.

In addition, the requirements in this manual primarily target the types of impacts associated with the most typical land development projects occurring in the lowland areas of the County. Applying these requirements to vastly different types of projects, such as rock quarries or dairy farms, or in different climatic situations, such as for ski areas, may result in poorer mitigation of impacts. Therefore, different mitigation may be required.

1.2 CORE REQUIREMENTS

This section details the following eight core requirements:

- Core Requirement #1: Discharge at the Natural Location, Section 1.2.1 (p. 1-19)
- Core Requirement #2: Offsite Analysis, Section 1.2.2 (p. 1-21)
- Core Requirement #3: Flow Control, Section 1.2.3 (p. 1-27)
- Core Requirement #4: Conveyance System, Section 1.2.4 (p. 1-56)
- Core Requirement #5: Temporary Erosion and Sediment Control, Section 1.2.5 (p. 1-61)
- Core Requirement #6: Maintenance and Operations, Section 1.2.6 (p. 1-65)
- Core Requirement #7: Financial Guarantees and Liability, Section 1.2.7 (p. 1-66)
- Core Requirement #8: Water Quality, Section 1.2.8 (p. 1-68).

1.2.1 CORE REQUIREMENT #1: DISCHARGE AT THE NATURAL LOCATION

REQUIREMENT

All surface and storm water runoff from a project must be discharged at the natural location so as not to be diverted onto or away from downstream properties. The manner in which runoff is discharged from the project site must not create a significant adverse impact to downhill properties or drainage systems (see "Discharge Requirements" below).

Intent: To prevent adverse impacts to downstream properties caused by diversion of flow from one flowpath to another, and to discharge in a manner that does not significantly impact downhill properties or drainage systems. Diversions can cause greater impacts (due to greater runoff volumes) than would otherwise occur from new development discharging runoff at the natural location. Diversions can also impact properties that rely on runoff water to replenish wells and ornamental or fish ponds. *Projects that do not discharge at the natural location will require an approved adjustment of this requirement (see Section 1.4).*

❑ DISCHARGE REQUIREMENTS

Proposed projects must comply with the following discharge requirements (1, 2, and 3) as applicable:

1. Where no conveyance system exists at the abutting downstream property line and the natural (existing) discharge is unconcentrated, any runoff concentrated by the proposed project must be discharged as follows:
 - a) IF the 100-year peak discharge²⁵ is less than or equal to 0.2 cfs under existing conditions and will remain less than or equal to 0.2 cfs under developed conditions, THEN the concentrated runoff may be discharged onto a rock pad or to any other system that serves to disperse flows.
 - b) IF the 100-year peak discharge is less than or equal to 0.5 cfs under existing conditions and will remain less than or equal to 0.5 cfs under developed conditions, THEN the concentrated runoff may be discharged through a dispersal trench or other dispersal system provided the applicant can demonstrate that there will be no significant adverse impact to downhill properties or drainage systems.
 - c) IF the 100-year peak discharge is greater than 0.5 cfs for either existing or developed conditions, or if a significant adverse impact to downhill properties or drainage systems is likely, THEN a conveyance system must be provided to convey the concentrated runoff across the downstream

²⁵ Peak discharges for applying this requirement are determined using KCRTS as detailed in Chapter 3.

properties to an acceptable discharge point.²⁶ Drainage easements for this conveyance system must be secured from downstream property owners and recorded prior to engineering plan approval.

2. IF a proposed project or any **natural discharge area** within a project is located within a *Landslide Hazard Drainage Area*²⁷ and, in fact, ultimately drains over the erodible soils of a SAO-defined landslide hazard area with slopes steeper than 15%, THEN a **tightline system must be provided** through the landslide hazard area to an acceptable discharge point unless one of the following exceptions applies. The tightline system must comply with the design requirements in Core Requirement #4 and in Section 4.2.2 unless otherwise approved by DDES. Drainage easements for this system must be secured from downstream property owners and recorded prior to engineering plan approval.

Exceptions: A tightline is not required for any **natural discharge location** where one of the following conditions can be met:

- a) Less than 2,000 square feet of new impervious surface will be added within the **natural discharge area**, OR
 - b) All runoff from the **natural discharge area** will be infiltrated for runoff events up to and including the 100-year event, OR
 - c) The *developed conditions runoff volume*²⁸ from the **natural discharge area** is less than 50% of the existing conditions runoff volume from other areas draining to the location where runoff from the natural discharge area enters the landslide hazard area onto slopes steeper than 15%, AND the provisions of Discharge Requirement 1 are met, OR
 - d) DDES determines that a tightline system is not physically feasible or will create a significant adverse impact based on a soils report by a geotechnical engineer.
3. For projects adjacent to or containing SAO-defined landslide, steep slope, or erosion hazard areas, the applicant must demonstrate that onsite drainage facilities and/or flow control BMPs will not create a significant adverse impact to downhill properties or drainage systems.

²⁶ *Acceptable discharge point* means an enclosed drainage system (i.e., pipe system, culvert, or tightline) or open drainage feature (e.g., ditch, channel, swale, stream, river, pond, lake, or wetland) where concentrated runoff can be discharged without creating a significant adverse impact.

²⁷ *Landslide Hazard Drainage Areas* are areas mapped by the County where it has been determined that overland flows from new projects will pose a significant threat to health and safety because of their close proximity to SAO-defined landslide hazard areas that are on slopes steeper than 15% (see the Definitions Section for a more detailed definition of SAO landslide hazard areas). Such areas are delineated on the Landslide Hazard Drainage Areas map adopted with this manual (see map pocket on inside of back cover).

²⁸ For the purposes of applying this exception, the *developed conditions runoff volume* is the average annual runoff volume as computed with KCRTS per Chapter 3. Any areas assumed not to be cleared when computing the developed conditions runoff volume must be set aside in an open space tract or covenant in order for the proposed project to qualify for this exception. Preservation of existing forested areas in Landslide Hazard Drainage Areas is encouraged.

1.2.2 CORE REQUIREMENT #2: OFFSITE ANALYSIS

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All proposed projects must submit an offsite analysis report that assesses potential offsite drainage impacts associated with development of the project site and proposes appropriate mitigations of those impacts. The initial permit submittal shall include, at minimum, a **Level 1 downstream analysis** as described in Section 1.2.2.1 below.

Intent: To identify and evaluate offsite drainage problems that may be created or aggravated by the proposed project, and to determine appropriate measures for preventing aggravation of those problems in accordance with the requirements of this manual.

The primary component of an offsite analysis report is the **downstream analysis**, which examines the drainage system within one-quarter mile downstream of the project site or farther as described in Section 1.2.2.1 below. It is intended to identify existing or potential/predictable downstream problems so that appropriate mitigation, as specified in Section 1.2.2.2 (p. 1-24), can be provided to prevent aggravation of these problems. A secondary component of the offsite analysis report is an **evaluation of the upstream drainage system** to verify and document that impacts will not occur as a result of the proposed project. The evaluation must extend upstream to a point where any backwater effects created by the project cease.

❑ EXEMPTION FROM CORE REQUIREMENT #2

A proposed project is exempt from Core Requirement #2 if any one of the following is true:

1. DDES determines there is sufficient information for them to conclude that the project will not have a significant adverse impact on the downstream and/or upstream drainage system, OR
2. The project adds less-no more than 52,000 square feet of new impervious surface, AND no more than 35,000 square feet of new impervious surface plus new pervious surface, AND does not construct or modify a drainage pipe/ditch that is 12 inches or more in size/depth or that receives runoff from a drainage pipe/ditch that is 12 inches or more in size/depth, AND does not contain or lie adjacent to a SAO-defined landslide, steep slope, or erosion hazard area, OR
3. The project does not change the rate, volume, duration, or location of discharges to and from the project site (e.g., where existing impervious surface is replaced with other impervious surface having similar runoff-generating characteristics, or where pipe/ditch modifications do not change existing discharge characteristics).

1.2.2.1 DOWNSTREAM ANALYSIS

The downstream analysis must consider the existing conveyance system(s) for a minimum flowpath distance downstream of one-quarter mile and beyond that as needed to reach a point where the project site area constitutes less than 15% of the tributary area. This minimum distance may be increased as follows:

- **Task 2** of a Level 1 downstream analysis (described in detail in Section 2.3.1.1) is a review of all available information on the downstream area and is intended to identify existing drainage problems. In all cases, **this information review shall extend one mile downstream** of the project site. The existence of flooding, erosion, or nuisance problems may extend the one-quarter-mile minimum distance for other tasks to allow evaluation of impacts from the proposed development to the identified problems.
- If a project's impacts to flooding, erosion, or nuisance problems are mitigated by improvements to the downstream conveyance system, the downstream analysis will extend a minimum of one-quarter mile beyond the improvement. This is necessary because many such improvements result in a reduction of stormwater storage or an increase in peak flows from the problem site.
- At their discretion, DDES may extend the downstream analysis beyond the minimum distance specified above on the reasonable expectation of impacts.

The **Level 1 downstream analysis** is a qualitative survey of each downstream system and is the first step in identifying flooding, erosion, or nuisance problems as defined below under "Downstream Problems Requiring Special Attention". Each Level 1 analysis is composed of four tasks at a minimum:

- Task 1: Define and map the study area
- Task 2: Review all available information on the study area
- Task 3: Field inspect the study area
- Task 4: Describe the drainage system, and its existing and predicted problems.

Upon review of the Level 1 analysis, DDES may require a Level 2 or 3 downstream analysis, depending on the presence of existing or predicted flooding, erosion, or nuisance problems identified in the Level 1 analysis.

Levels 2 and 3 downstream analysis quantify downstream problems by providing information on the severity and frequency of an existing problem or the likelihood of creating a new problem. A Level 2 analysis is a rough quantitative analysis (non-survey field data, uniform flow analysis). Level 3 is a more precise analysis (survey field data, backwater analysis) of significant problems. If conditions warrant, additional, more detailed analysis may be required beyond Level 3.

A detailed description of offsite analysis scope and submittal requirements is provided in Section 2.3.1.1. Hydrologic analysis methods and requirements for Levels 2 and 3 downstream analysis are contained in Chapter 3; hydraulic analysis methods are contained in Chapter 4.

□ DOWNSTREAM PROBLEMS REQUIRING SPECIAL ATTENTION

While the ~~basic-area-specific~~ flow control ~~standards-facility requirement~~ in Core Requirement #3 ([Section 1.2.3.2](#)) serves to minimize the creation and aggravation of many types of downstream drainage problems, there are some types that are more sensitive to aggravation than others depending on the nature or severity of the problem and which ~~basic~~-flow control ~~facility~~ standard is being applied. In particular, there are three types of downstream problems where the County has determined that the nature and/or severity of the problem warrants additional attention through the downstream analysis and possibly additional mitigation to ensure no aggravation:

1. Conveyance system nuisance problems
2. Severe erosion problems
3. Severe flooding problems.

Conveyance system nuisance problems are minor but chronic flooding or erosion problems that result from the overflow of a constructed conveyance system that is substandard or has become too small due to upstream development. Such problems warrant additional attention because of their chronic nature and because they result from the failure of a conveyance system to provide a minimum acceptable level of protection (see definition below). Severe flooding and erosion problems as defined below also warrant additional attention because they either pose a significant threat to health and safety or can cause significant damage to public or private property.

Conveyance System Nuisance Problems (Type 1)

Nuisance problems in general are defined as any existing or predicted flooding or erosion which does not constitute a severe flooding or erosion problem as defined below. *Conveyance system nuisance problems* are defined as any nuisance flooding or erosion that results from the overflow of a constructed conveyance system for runoff events less than or equal to a 10-year event. Examples include inundation of a shoulder or lane of a roadway, overflows collecting in yards or pastures, shallow flows across driveways, minor flooding of crawl spaces or unheated garages/outbuildings, and minor erosion.

If a conveyance system nuisance problem is identified or predicted downstream, the need for additional mitigation must be evaluated as specified in Section 1.2.2.2 under "Problem-Specific Mitigation"

Requirements" (p. 1-25). This may entail additional onsite flow control or other measures as needed to prevent creation or significant aggravation of the problem.

For any other nuisance problem which may be identified downstream, this manual does not require mitigation beyond the basic [area-specific](#) flow control [standard-facility requirement](#) applied in Core Requirement #3 ([Section 1.2.3.2](#)). This is because to prevent aggravation of such problems (e.g., those caused by the elevated water surfaces of ponds, lakes, wetlands, and closed depressions or those involving downstream erosion) can require two to three times as much onsite detention volume, which is considered unwarranted for addressing nuisance problems. However, if under some unusual circumstance, the aggravation of such a nuisance problem is determined by DDES to be a significant adverse impact, additional mitigation may be required.

Severe Erosion Problems (Type 2)

Severe erosion problems are defined as downstream channels, ravines, or slopes with evidence of or potential for erosion/incision sufficient to pose a sedimentation hazard to downstream conveyance systems or pose a landslide hazard by undercutting adjacent slopes. Severe erosion problems do not include roadway shoulder rilling or minor ditch erosion.

If a severe erosion problem is identified or predicted downstream, additional mitigation must be considered as specified in Section 1.2.2.2 under "Problem-Specific Mitigation Requirements" (p. 1-25). This may entail additional onsite flow control or other measures as needed to prevent creation or aggravation of the problem.

Severe Flooding Problems (Type 3)

Severe flooding problems can be caused by conveyance system overflows or the elevated water surfaces of ponds, lakes, wetlands, or closed depressions. *Severe flooding problems* are defined as follows:

- Flooding of the *finished area*²⁹ of a *habitable building*,³⁰ or the electrical/heating system of a habitable building for runoff events less than or equal to a 100-year event. Examples include flooding of finished floors of homes and commercial or industrial buildings, or flooding of electrical/heating system components in the crawl space or garage of a home. Such problems are referred to in this manual as ***severe building flooding problems***.
- Flooding over all lanes of a *roadway*³¹ or *severely impacting a sole access driveway*³² for runoff events less than or equal to the 100-year event. Such problems are referred to in this manual as ***severe roadway flooding problems***.

If a severe flooding problem is identified or predicted downstream, the need for additional mitigation must be evaluated as specified in Section 1.2.2.2 under "Problem-Specific Mitigation Requirements" (p. 1-25). This may entail consideration of additional onsite flow control or other measures as needed to prevent creation or significant aggravation of the problem.

²⁹ *Finished area*, for the purposes of this definition, means any enclosed area of a building that is designed to be served by the building's permanent heating or cooling system.

³⁰ *Habitable building* means any residential, commercial, or industrial building that is equipped with a permanent heating or cooling system and an electrical system.

³¹ *Roadway*, for the purposes of this definition, means the traveled portion of any public or private road or street classified as such in the *King County Road Standards*.

³² *Sole access driveway* means there is no other unobstructed, flood-free route for emergency access to a habitable building. *Severely impacting* means the flooding overtops a culverted section of the driveway, posing a threat of washout or unsafe access conditions due to indiscernible driveway edges, or the flooding is deeper than 6 inches on the driveway, posing a severe impediment to emergency access.

1.2.2.2 IMPACT MITIGATION

A proposed project must not significantly aggravate existing downstream problems or create new problems as a result of developing the site. This manual does not require development proposals to fix or otherwise reduce the severity of existing downstream drainage problems, although doing so may be an acceptable mitigation.

Principles of Impact Mitigation

Aggravation of an existing downstream problem means increasing the frequency of occurrence and/or severity of the problem. Increasing peak flows at the site of a problem caused by conveyance system overflows can increase the frequency of the problem's occurrence. Increasing durations of flows at or above the overflow return frequency can increase the severity of the problem by increasing the depth and duration of flooding. Controlling peaks and durations through onsite detention can prevent aggravation of such problems by releasing the increased volumes due to development only at return frequencies below the conveyance overflow return frequency, with the net result of causing the conveyance system to flow full for a longer period of time.

When a problem is caused by high water-surface elevations of a volume-sensitive water body, such as a lake, wetland, or closed depression, aggravation means the same as for problems caused by conveyance overflows. Increasing the volume of flows to a volume-sensitive water body can increase the frequency of the problem's occurrence. Increasing the duration of flows for a range of return frequencies both above and below the problem return frequency can increase the severity of the problem; mitigating these impacts requires control of flow durations for a range of return frequencies both above and below the problem return frequency. The net effect of this duration control is to release the increased volumes due to development only at water surface elevations below that causing the problem, which in turn can cause an increase in these lower, but more frequently occurring, water surface elevations. This underscores an unavoidable impact of development upstream of volume-sensitive water bodies: the increased volumes generated by the development will cause some range of increase in water surface elevations, no matter what detention standard is applied.

Creating a new problem means increasing peak flows and/or volumes such that after development, the frequency of conveyance overflows or water surface elevations exceeds the thresholds for the various problem types discussed in Section 1.2.2.1. For example, application of the Level 1 flow control standard requires matching ~~predeveloped and developed~~[the existing site conditions](#) 2- and 10-year peak flows. The 100-year peak flow is only partially attenuated, and the flow increase may be enough to cause a "severe flooding problem" as described on page 1-23. The potential for causing a new problem is often identified during the Level 1 downstream analysis, where the observation of a reduction in downstream pipe sizes, for example, may be enough to predict creation of a new problem. A Level 2 or 3 analysis will typically be required to verify the capacity of the system and determine whether 100-year flows can be safely conveyed.

Significance of Impacts to Existing Problems

The determination of whether additional onsite mitigation or other measures are needed to address an existing downstream problem depends on the significance of the proposed project's predicted impact on that problem. For some identified problems, DDES will make the determination as to whether the project's impact is significant enough to require additional mitigation. For the downstream problems defined on pages 1-20 and 1-23, this threshold of significant impact or aggravation is defined below.

For conveyance system nuisance problems, the problem is considered significantly aggravated if there is any increase in the project's contribution to the frequency of occurrence and/or severity of the problem for runoff events less than or equal to the 10-year event. *Note: Increases in the project's contribution to this type of problem are considered to be prevented if sufficient onsite flow control and/or offsite improvements are provided as specified in Table 1.2.3.A (p. 1-35).*

For **severe erosion problems**, the problem is considered significantly aggravated if there is any increase in project's **existing** contribution to the *flow duration*³³ of peak flows ranging from 50% of the 2-year peak flow up to the full 50-year peak flow at the eroded area. *Note: Increases in the project's contribution to this type of problem are considered to be prevented if Level 2 flow control or offsite improvements are provided as specified in Table 1.2.3.A (p. 1-35).*

For **severe building flooding problems**, the problem is considered significantly aggravated if there is any increase in the project's **existing** contribution³⁴ to the frequency, depth, and/or duration of the problem for runoff events less than or equal to the 100-year event.

For **severe roadway flooding problems**, the problem is considered significantly aggravated if any of the following thresholds are exceeded and there is any increase in the project's **existing** contribution²⁸ to the frequency, depth, and/or duration of the problem for runoff events less than or equal to the 100-year event:

- The *existing flooding*³⁵ over all lanes of a roadway or overtopping the culverted section of a "sole access driveway" is predicted to increase in depth more than a quarter-inch or 10% (whichever is greater) for the 100-year runoff event.
- The "existing flooding" over all lanes of a roadway or "severely impacting a sole access driveway" is more than 6 inches deep or faster than 5 feet per second for runoff events less than or equal to the 100-year event.
- The "existing flooding" over all lanes of a *sole access roadway*³⁶ is more than 3 inches deep or faster than 5 feet per second for runoff events less than or equal to the 100-year event, or is at any depth for runoff events less than or equal to the 10-year event.

❑ PROBLEM-SPECIFIC MITIGATION REQUIREMENTS

1. IF a proposed project or threshold discharge area within a project drains to one or more of the three types of downstream drainage problems defined in Section 1.2.2.1 (pages 1-20 and 1-23) as identified through a downstream analysis, THEN the applicant must do one of the following:
 - a) Submit a Level 2 or Level 3 downstream analysis per Section 2.3.1 demonstrating that the proposed project will not create or significantly aggravate the identified downstream problem(s), OR
 - b) Show that the natural discharge area or threshold discharge area draining to the identified problem(s) qualifies for an exemption from Core Requirement #3: Flow Control ([Section 1.2.3, p. 1-29](#)) or an exception from the applicable area-specific flow control facility requirement per [Section 1.2.3.1 \(p. 1-34\)](#), OR
 - c) Document that the ~~basic~~³⁷ applicable area-specific flow control ~~standard~~³⁸ facility requirement ~~specified~~³⁹ required in Core Requirement #3 is adequate to prevent creation or significant aggravation of the identified downstream problem(s) as indicated in Table 1.2.3.A (p. 1-35) with the phrase, "No additional flow control needed", OR

³³ *Flow duration* means the aggregate time that peak flows are at or above a particular flow rate of interest (e.g., the amount of time over the last ~~40-50~~ years that peak flows were at or above the 2-year flow rate).

³⁴ Increases in the project's contribution are considered to be prevented if sufficient onsite flow control and/or offsite improvements are provided as specified for "severe flooding problems" in Table 1.2.3.A (p. 1-35). For "severe flooding problems" located within the mapped 100-year floodplain of a "major receiving water" (see , p. 1-31) or the mapped 100-year floodplain of a major stream for which there is an adopted basin plan, increases in the project's contribution are considered negligible (zero) regardless of the flow control standard being applied, unless DDES determines there is a potential for increased flooding separate from that associated with the existing 100-year floodplain.

³⁵ *Existing flooding*, for the purposes of this definition, means flooding over all lanes of the roadway or driveway has occurred in the past and can be verified by County records, County personnel, photographs, or other physical evidence.

³⁶ *Sole access roadway* means there is no other flood-free route for emergency access to one or more dwelling units.

- d) Provide additional onsite flow control necessary to prevent creation or significant aggravation of the downstream problem(s) as specified in Table 1.2.3.A (p. 1-35) and further detailed in Section 3.3.5, OR
 - e) Provide offsite improvements necessary to prevent creation or significant aggravation of the identified downstream problem(s) as detailed in Chapter 3 unless identified as not necessary in Table 1.2.3.A (p. 1-35), OR
 - f) Provide a combination of additional onsite flow control and offsite improvements sufficient to prevent creation or significant aggravation of the downstream problem(s) as demonstrated by a Level 2 or Level 3 downstream analysis.
2. IF it is identified that the manner of discharge from a proposed project may create a significant adverse impact as described in Core Requirement #1, THEN DDES may require the applicant to implement additional measures or demonstrate the impact will not occur.

Intent: To ensure provisions are made (if necessary) to prevent creation or significant aggravation of the three types of downstream problems requiring special attention by this manual, and to ensure compliance with the discharge requirements of Core Requirement #1.

In addressing downstream problems per Problem-Specific Mitigation Requirement 1 above, the easiest of the provisions to implement will often be that of additional onsite flow control. This involves designing the required onsite flow control facility to meet an additional set of performance criteria targeted to prevent significant aggravation of specific downstream problems. To save time and analysis, a set of predetermined flow control performance criteria corresponding to each of the three types of downstream problems is provided in Table 1.2.3.A (p. 1-35) and described in more detail in Chapter 3.

Note that in some cases the ~~basic~~-area-specific flow control ~~standard-facility requirement~~ applicable to the proposed project per Section 1.2.3.1 (p. 1-34) is already sufficient to prevent significant aggravation of many of the defined downstream problem types. Such situations are noted in Table 1.2.3.A (p. 1-35) as not needing additional onsite flow control or offsite improvements. For example, if the project is located within a Conservation Flow Control Area subject to the Level 2 flow control standard ~~is required by per~~ Section 1.2.3.1 (p. 1-40), and a conveyance system nuisance problem is identified through offsite analysis per Core Requirement #2, no additional onsite flow control is needed, and no offsite improvements are necessary.

1.2.3 CORE REQUIREMENT #3: FLOW CONTROL

REQUIREMENT

All proposed projects, including redevelopment projects, must provide onsite flow control facilities or flow control BMPs or both to mitigate the impacts of ~~increased~~ storm and surface water runoff generated by ~~the addition of new impervious surface and any related land cover conversion~~ new impervious surface, new pervious surface, and replaced impervious surface targeted for flow mitigation as specified in the following sections. These **Flow control facilities** must be provided and designed to perform as specified by the area-specific flow control facility requirement ~~shall, at a minimum, meet the performance criteria for one of the area-specific flow control standards described~~ in Section 1.2.3.1 (p. 1-34) and ~~be implemented according to~~ in accordance with the applicable flow control facility implementation requirements in Section 1.2.3.2 (p. 1-47). **Flow control BMPs** must be applied to certain surfaces and projects as specified by the BMP requirements in Section 1.2.3.3 (p. 1-52).

Intent: To ensure the minimum level of control needed to protect downstream properties and resources from increases in peak, duration, and volume of runoff generated by new development. The level of control varies depending on location and downstream conditions identified under Core Requirement #2.

Guide to Applying Core Requirement #3

Core Requirement #3 requires that onsite detention and/or infiltration facilities be constructed to control runoff discharges from the project site. ~~These facilities must meet a minimum flow control performance standard as set forth in Section 1.2.3.1, "Area-Specific Flow Control Standards" (page 1-32), and may need to be even larger to ensure that downstream problems are not created or significantly aggravated as set forth in Section 1.2.2.2, "Problem-Specific Mitigation Requirements" (p. 1-23). Table 1.2.3.A (p. 1-30) provides a quick guide for selecting the flow control performance criteria necessary to meet both of these requirements.~~

Area-specific flow control standards target the level of flow control performance to the protection needs of specific regions or areas of the county. These areas are called *flow control areas*, and there are three such areas depicted on the Flow Control Applications Map adopted with this manual (see map pocket on inside of back cover). Each flow control area has a basic flow control standard that is specific to that area. The performance criteria of that basic standard may need to be increased to address a specific downstream drainage problem as explained in Step 4 below.

Flow control implementation requirements are the minimum requirements for analyzing and designing flow control facilities to achieve required performance and other protection goals.

For efficient application of Core Requirement #3, the following steps are recommended:

1. Use the Flow Control Applications Map to determine the flow control area in which your project is located. If this determination can not be made from the map, a more detailed delineation of flow control areas is available on King County's Geographic Information System (GIS).
2. Check the list of exemptions beginning on page 1-26 to determine if and/or which portions of your project must provide flow control facilities per Core Requirement #3.
3. If flow control facilities are required, determine (for the flow control area identified above) which area-specific flow control standard applies to your project by consulting the detailed threshold information in Section 1.2.3.1. The applicable flow control standard will determine the minimum flow control performance required for your proposed project.
4. If downstream problems were identified through offsite analysis per Core Requirement #2 and are proposed to be addressed through onsite flow control, use Table 1.2.3.A (p. 1-30) to determine if and what additional flow control performance is necessary to mitigate impacts (i.e., to prevent creation or aggravation of the identified problems).
5. Use Section 1.2.3.2 (p. 1-38) to determine the minimum requirements for implementing flow controls.

TABLE 1.2.3.A SUMMARY OF FLOW CONTROL PERFORMANCE CRITERIA ACCEPTABLE FOR IMPACT MITIGATION⁽⁴⁾			
Downstream Problems Identified through Offsite Analysis per Core Requirement #2	AREA-SPECIFIC STANDARD		
	Level 1 Flow Control	Level 2 Flow Control	Level 3 Flow Control
No problem identified. Apply basic standard performance criteria.	Match 2-yr & 10-yr peaks	Match durations for 50%-of 2-yr through 50-yr peaks	Match durations for 50%-of 2-yr through 50-yr peaks AND match 100-year peaks
Type 1 Conveyance System Nuisance Problem	Additional Flow Control Hold 10-yr peak to overflow T_r peak⁽²⁾⁽³⁾	No additional flow control or other mitigation is needed	No additional flow control or other mitigation is needed
Type 2 Severe Erosion Problem	Additional Flow Control Apply Level 2 flow control⁽³⁾⁽⁴⁾	No additional flow control is needed, but other mitigation may be required⁽⁴⁾	No additional flow control is needed, but other mitigation may be required⁽⁴⁾
Type 3 Severe Flooding Problem	Additional Flow Control Apply Level 3 flow control. If flooding is from conveyance system overflow, Level 3 may be modified to match durations above the overflow T_r peak rather than 50% of the 2-yr peak. If flooding is from a closed depression, make design adjustments as needed to meet the "special provision for closed depressions"⁽³⁾⁽⁵⁾	Additional Flow Control Apply Level 3 flow control. If flooding is from a closed depression, make design adjustments as needed to meet the "special provision for closed depressions"⁽³⁾⁽⁵⁾	Additional Flow Control If flooding is from a closed depression, make design adjustments as needed to meet the "special provision for closed depressions"⁽³⁾⁽⁵⁾
Notes: ⁽⁴⁾ More than one set of problem-specific performance criteria may apply if two or more downstream problems are identified through offsite analysis per Core Requirement #2. If this happens, the performance goals of each applicable problem-specific criteria must be met. This can require extensive, time-consuming analysis to implement multiple sets of outflow performance criteria if additional onsite flow control is the only viable option for mitigating impacts to these problems. In these cases, it may be easier and more prudent to implement the Level 3 flow control standard in place of the otherwise required area-specific standard. Use of the Level 3 flow control standard satisfies the specified performance criteria for all the area-specific and problem-specific requirements except if adjustments are required per the special provision for closed depressions described below in Note 5. ⁽²⁾ Overflow T_r is the return period of conveyance system overflow. To determine T_r requires a minimum Level 2 downstream analysis as detailed in Section 2.3.1.1. To avoid this analysis, a T_r of 2 years may be assumed. ⁽³⁾ Offsite improvements may be implemented in lieu of or in combination with additional flow control as allowed in Section 1.2.2.2 (p. 1-22) and detailed in Section 3.3.5. ⁽⁴⁾ A tightline system may be required regardless of the flow control standard being applied if needed to meet the discharge requirements of Core Requirement #1 (p. 1-17) or the outfall requirements of Core Requirement #4 (p. 1-44), or is deemed necessary by DDES where the risk of severe damage is high. ⁽⁵⁾ Special Provision for Closed Depressions with a Severe Flooding Problem: IF the proposed project discharges by overland flow or conveyance system to a closed depression experiencing a "severe flooding problem" AND the amount of impervious surface area proposed by the project is greater than or equal to 10% of the 100-year water surface area of the closed depression, THEN use the "point of compliance analysis technique" described in Section 3.3.6 to verify that water surface levels are not increasing for the return frequencies at which flooding occurs, up to and including the 100-year frequency. If necessary, iteratively adjust onsite flow control performance to prevent increases. Note: The "point of compliance analysis" relies on certain field measurements taken directly at the closed depression (e.g., soils tests, topography, etc.). If permission to enter private property for such measurements is denied, DDES may waive this provision and apply the Level 3 flow control standard with a mandatory 20% safety factor on the storage volume.			

❑ EXEMPTIONS FROM CORE REQUIREMENT #3

~~There are three possible exemptions from the flow control provisions of Core Requirement #3: There are eight possible exemptions from the requirement to provide a formal flow control facility per Core Requirement #3. The intent of these exemptions is to provide for situations where a facility may not be practical or needed, where other alternatives to a facility can be just as effective, or where it makes sense to provide incentives for retaining native vegetation or for maximizing use of existing developed areas.~~

1. Impervious Surface Basic Exemption

A proposed project or any **threshold discharge area** within a project is exempt if it meets all of the following criteria:

- a) Less than 52,000 square feet of new impervious surface will be added, and
- b) If the project is a redevelopment project, less than 5,000 square feet of new plus replaced impervious surface will be created, AND
- c) Less than 35,000 square feet of new impervious plus new pervious surface will be added, the project or threshold discharge area is not within a Landslide Hazard Drainage Area.³⁷ If the project or threshold discharge area is located within a Landslide Hazard Drainage Area, this exemption only applies to new impervious surface less than 2,000 square feet.

2. Impervious Surface Exemption for Transportation Redevelopment Projects

A proposed transportation redevelopment project or any **threshold discharge area** within such a project is exempt if it meets all of the following criteria:

- a) The total new impervious surface within the project limits is less than 50% of the existing impervious surface, AND
- b) Less than 2,000 square feet of new impervious surface will be added, AND
- c) Less than 35,000 square feet of new impervious plus new pervious surface will be added.

3. Cost Exemption for Non-Transportation Redevelopment Projects

A proposed redevelopment project (excluding transportation redevelopment projects) or any **threshold discharge area** within such a project is exempt if it meets all of the following criteria:

- a) The total valuation of the project's proposed improvements (including interior improvements and excluding required mitigation improvements) is less than 50% of the assessed value of the existing site improvements, AND
- b) Less than 2,000 square feet of new impervious surface will be added, AND
- c) Less than 35,000 square feet of new impervious plus new pervious surface will be added.

2. Impervious Surface Exemption Using Flow Control BMPs

~~Any **threshold discharge area** within a proposed project is exempt if less than 10,000 square feet of new impervious surface will be added, AND all of the following criteria are met:~~

- ~~a) The area cleared to accommodate the proposed project must be less than 35% or less than 2 acres of the **threshold discharge area** (whichever is greater), AND~~
- ~~b) If the project is a single family residential project, flow control BMPs must be applied within the threshold discharge area as specified in *Small Site Drainage Requirements* (detached Appendix C), AND~~

³⁷ *Landslide Hazard Drainage Areas* are delineated on a map adopted with this manual (see map pocket on inside of back cover).

- e) ~~For projects other than single family residential projects~~, the new impervious surface within the threshold discharge area must be comprised of either non-pollution-generating roofs that comply with the roof downspout controls in Section 5.1, OR roads, trails, or driveways that comply with the rural roadway dispersion requirements in Section 5.2.1, AND
- d) ~~The manner in which runoff is discharged~~ from the project site must not create a significant adverse impact per Core Requirement #1.

3. ~~Peak Flow Exemption Using Flow Control BMPs~~

Any ~~threshold discharge area~~ within a proposed project is exempt if the project improvements within the threshold discharge area generate less than a 0.1 cfs increase in the ~~existing site conditions~~³⁸ 100-year peak flow rate, AND all of the following criteria are met:

- a) If the project is a ~~redevelopment project~~, flow control BMPs must be applied as specified in Section 5.2, and the project improvements must not significantly impact a "severe erosion problem" or "severe flooding problem" (see page 1-21), and must not be located within a Landslide Hazard Drainage Area, AND
- b) If the project is a ~~single family residential project~~, the runoff from impervious surfaces must be infiltrated or dispersed using flow control BMPs specified in Appendix C, and any areas of native vegetation assumed not to be cleared for the purposes of computing the increase in 100-year peak flow must be preserved within a tract or by covenant as described in Appendix C, AND
- e) ~~For projects other than redevelopment projects and single family residential projects~~, the new impervious surface within the threshold discharge area must be comprised of either non-pollution-generating roofs that comply with the roof downspout controls in Section 5.1, OR roads, trails, or driveways that comply with the rural roadway dispersion requirements in Section 5.2.1, AND
- d) ~~The manner in which runoff is discharged~~ from the project site must not create a significant adverse impact per Core Requirement #1.

4. ~~Peak Flow Exemption for Urban Redevelopment Projects~~

Any ~~natural discharge area~~ of a redevelopment project located within the Urban Growth Area is exempt if the project improvements within the natural discharge area generate less than a 0.1 cfs increase in the existing site conditions 100-year peak flow, AND all of the following criteria are met:

- a) The application of this exemption to natural discharge areas within a proposed project must not result in more than a 0.4 cfs increase in the existing site conditions 100-year peak flow rate for any ~~threshold discharge area~~ of the project, AND
- b) ~~Flow control BMPs~~ must be applied to the runoff from new impervious surfaces as specified in Section 5.2.1, AND
- e) The project improvements within the ~~natural discharge area~~ must not be located within a Landslide Hazard Drainage Area and must not significantly impact a "severe erosion problem" or "severe flooding problem" (see page 1-21), AND
- d) ~~The manner in which runoff is discharged~~ from the project site must not create a significant adverse impact per Core Requirement #1.

³⁸ *Existing site conditions* depend on what, if any, land conversion activity has occurred on the site since May 1979 when King County first required flow control on developments adding more than 5,000 square feet of new impervious surface. IF a drainage plan has been approved by the County since May 1979 for any land conversion activity which includes the addition of more than 5,000 square feet of new impervious surface, THEN *existing site conditions* are those created by the site improvements and drainage facilities constructed per the approved engineering plans. OTHERWISE, *existing site conditions* are those that existed prior to May 1979 as determined from aerial photographs and, if necessary, on knowledge of individuals familiar with the area. The intent is to mitigate unaddressed impacts created by site alterations or improvements, such as clearing, which have occurred since May 1979.

5. ~~Forested Open Space Exemption for Rural Residential Projects~~

Any ~~natural discharge area~~ within a proposed rural residential project (zoned RA-2.5, RA-5, RA-10, or RA-20) is exempt if all of the following criteria are met:

- a) ~~At least 65% of the unsubmerged portion³⁹ of the natural discharge area will be set aside as forested open space as specified in Section 5.2.1, AND~~
- b) ~~The runoff from new impervious surfaces within the natural discharge area will be dispersed over native vegetation using the flow control BMPs detailed in Section 5.2.1, AND~~
- c) ~~The manner in which runoff is discharged from the project site will not create a significant adverse impact per Core Requirement #1.~~

6. ~~Direct Discharge Exemption~~

Any ~~natural discharge area~~ within a proposed project is exempt if it drains to one of the "major receiving waters" listed in Table 1.2.3.B, AND meets all of the following criteria for *direct discharge*⁴⁰ to that receiving water:

- a) ~~The flowpath from the project site discharge point to the edge of the 100-year floodplain of the major receiving water shall be no longer than a quarter mile, except for discharges to Lake Sammamish, Lake Washington, and Puget Sound, AND~~
- b) ~~The conveyance system between the project site and the ordinary high water line of the major receiving water shall be comprised of manmade conveyance elements (pipes, ditches, outfall protection, etc.) and shall be within public right-of-way or a public or private drainage easement, AND~~
- c) ~~The conveyance system shall have adequate capacity per Core Requirement #4, Conveyance System, for the entire contributing drainage area, assuming build-out conditions to current zoning for the "equivalent area" portion (defined in Figure 1.2.3.A, below) and existing conditions for the remaining area, AND~~
- d) ~~The conveyance system will be adequately stabilized to prevent erosion, assuming the same basin conditions as assumed in Criteria (c) above, AND~~
- e) ~~The direct discharge proposal will not divert flows from or increase flows to an existing wetland or stream sufficient to cause a significant adverse impact.~~

TABLE 1.2.3.B — MAJOR RECEIVING WATERS

<input type="checkbox"/> Cedar River	<input type="checkbox"/> Tolt River
<input type="checkbox"/> Green/Duwamish River below River Mile 6 (S. Boeing Access Road) and above SR 18	<input type="checkbox"/> Lake Meridian
<input type="checkbox"/> Snoqualmie River (includes the North, South, and Middle Forks)	<input type="checkbox"/> Lake Sawyer
<input type="checkbox"/> Sammamish River	<input type="checkbox"/> Lake Sammamish
<input type="checkbox"/> White/Stuck River	<input type="checkbox"/> Lake Washington
<input type="checkbox"/> Skykomish River	<input type="checkbox"/> Puget Sound

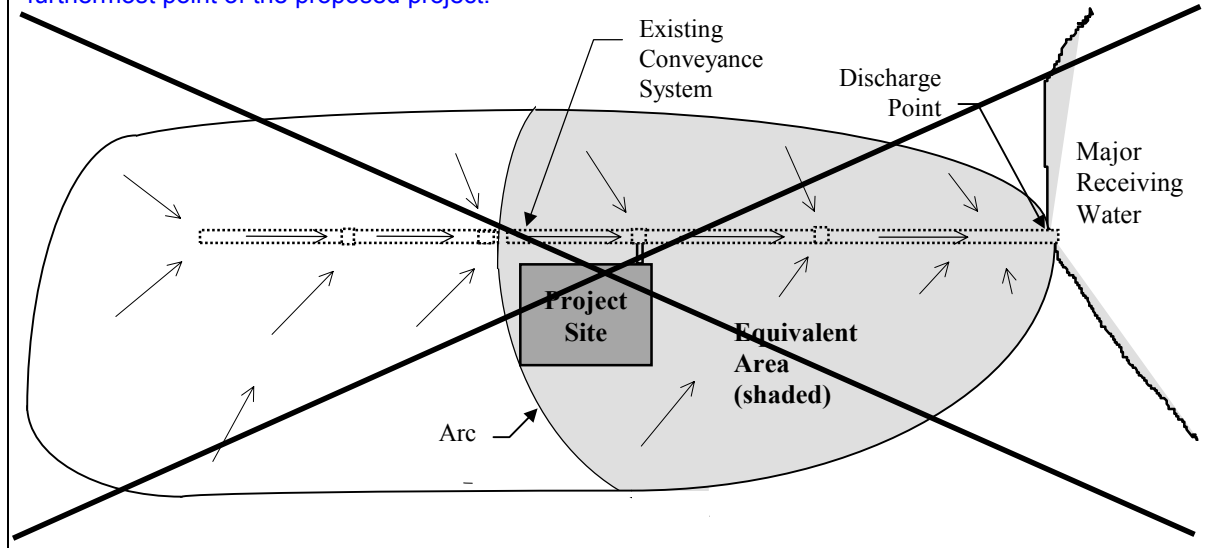
Note: "Major Receiving Waters" do not include side channels, spring or groundwater-fed streams, or wetland habitats that provide salmonid spawning or rearing habitat that may be connected or adjacent to major rivers.

³⁹ *Unsubmerged portion* means any portion outside the ordinary high water line of streams, lakes, and wetlands.

⁴⁰ *Direct discharge* means undetained discharge from a proposed project to a "major receiving water."

FIGURE 1.2.3.A—EQUIVALENT AREA DEFINITION AND ILLUSTRATION

Equivalent area: The area tributary to a direct discharge conveyance system that is contained within an arc formed by the shortest, straight line distance from the conveyance system discharge point to the furthestmost point of the proposed project.



7.—Peak Flow Exemption for Urban Residential Infill Projects

Any **single family residential project** located within the Urban Growth Area is exempt if the total project improvements (within a single threshold discharge area) will generate less than a 0.4 cfs increase in the existing site conditions 100-year peak flow, AND all of the following criteria are met:

- The surrounding area within $\frac{1}{4}$ mile of the project site must be over **75% built-out**⁴¹ to the zoned density as of the year 1998, AND
- The project must be within a **Level 1 Flow Control Area** as indicated on the Flow Control Applications Map adopted with this manual or otherwise subject to Level 1 flow control (see page 1-31), AND
- The proposed project must not drain to a “**severe flooding problem**” or “**severe erosion problem**” as defined on page 1-21, AND
- The runoff from new impervious surfaces must be infiltrated or dispersed using **flow control BMPs** specified in Appendix C, and any areas of native vegetation assumed not to be cleared for the purposes of computing the increase in 100-year peak flow must be preserved within a tract or by covenant as described in Appendix C, AND
- The **manner in which runoff is discharged** from the project site must not create a significant adverse impact per Core Requirement #1.

⁴¹ *Percent build-out* is calculated by dividing the number of existing residential dwelling units (including existing multifamily units) by the total potential number of residential dwelling units as determined from current base zoning. The total potential number of residential dwelling units is defined as the sum of (1) existing residential dwelling units, (2) existing vacant non-subdividable single family residential lots, (3) potential single family residential lots (net buildable area of subdividable parcels multiplied by the base zoning, and subtracting out any lots with existing residential dwelling units), and (4) potential multifamily dwelling units on vacant or subdividable multifamily-zoned parcels. Permanent open space areas (e.g., sensitive areas and buffers, recreational tracts) and those properties that are zoned commercial or industrial, or are publicly owned (e.g., parks, schools, arterial roadways, stormwater tracts) shall be excluded from these calculations.

8. ~~Discretionary Exemption for Infill Projects~~

~~Using the procedures detailed in Sections 1.4.3 and 1.4.4 of the adjustment process, the DDES Land Use Services Division Manager/designee or Building Services Division Manager/designee may grant an exemption from the flow control requirements in Core Requirement #3 provided all of the following criteria are met:~~

- ~~a) The catchment (defined as the tributary area to a point where the project site comprises 15% of the tributary area, or ¼ mile downstream, whichever is greatest) is over 90% built-out to the zoned density, AND~~
- ~~b) Eighty percent of the existing development within the catchment was constructed prior to 1979 (as determined from aerial photos) or is otherwise without formal flow control, AND~~
- ~~c) There are no Class 1 or 2 streams with salmonids within ½ mile downstream of the project site (except streams designated as major receiving waters), AND~~
- ~~d) There are no Class 1 wetlands within ½ mile downstream of the project site, AND~~
- ~~e) There are no "severe building flooding problems" (see page 1-21) within 1 mile downstream of the project site, AND~~
- ~~f) Undetained flows from the proposed project will generate less than a 10% increase in the 10-year peak flows to a downstream conveyance system nuisance problem" (see page 1-20).~~

1.2.3.1 AREA-SPECIFIC FLOW CONTROL ~~STANDARDS~~ FACILITY REQUIREMENT

R E Q U I R E M E N T

Projects subject to Core Requirement #3 must, ~~at a minimum, comply with one of the three~~ provide flow control facilities as specified by the area-specific flow control facility requirements and exceptions for the designated flow control area in which the proposed project or threshold discharge area of the proposed project is located as described in Subsections A, B, and C below. standards: Level 1, Level 2, or Level 3, whichever applies per the threshold information detailed in this section.

Guide to Applying the Area-Specific Flow Control Facility Requirement

The flow control facility requirement varies across the county landscape according to the *flow control area* within which the project or a threshold discharge area of the project is located. Flow control areas are designated by the county to target the level of flow control performance to the broad protection needs of specific basins or subbasins. There are currently three such flow control areas, which are depicted on the Flow Control Applications Map adopted with this manual (see map pocket on inside of back cover). These are the **Basic Flow Control Areas**, **Conservation Flow Control Areas**, and **Flood Problem Flow Control Areas**. Each flow control area has an area-specific set of minimum flow control facility performance criteria, design assumptions, surfaces that must be mitigated, and exceptions. These provisions all comprise what is referred to as the "area-specific flow control facility requirement".

Note that the minimum required performance of the facility as specified by this requirement may need to be increased to ensure that downstream problems are not created or significantly aggravated as set forth in Section 1.2.2.2, "Problem-Specific Mitigation Requirements" (p. 1-25). Table 1.2.3.A (p. 1-35) provides a quick guide for selecting the flow control performance criteria necessary to meet both the area-specific flow control facility requirement and the problem-specific mitigation requirement. This is further explained in Step 4 below.

For efficient application of the flow control facility requirement, the following steps are recommended:

1. Check the direct discharge exemption criteria on Page 1-36 to determine if and/or which portions of your project are exempt from the flow control facility requirement. If exempt from the flow control facility requirement, proceed to Step 6.
2. Use the Flow Control Applications Map to determine the flow control area in which your project is located. If this determination can not be made from the map, a more detailed delineation of flow control areas is available on King County's Geographic Information System (GIS).
3. Consult the detailed requirement and exception language for the identified flow control area to determine if and how the flow control facility requirement applies to your project. This requirement and exception language is detailed on subsequent pages for each of the three flow control areas depicted on the Flow Control Applications Map. If a flow control facility is not applicable per the area-specific exceptions, proceed to Step 6.
4. If downstream problems were identified through offsite analysis per Core Requirement #2 and are proposed to be addressed through onsite flow control, use Table 1.2.3.A (p. 1-35) to determine if and what additional flow control performance is necessary to mitigate impacts (i.e., to prevent creation or aggravation of the identified problems).
5. Use Section 1.2.3.2 (p. 1-47) to identify the applicable requirements for implementing the flow control facility requirement. These requirements cover such things as facility siting, analysis and design, unusual situations, and other site-specific considerations.

TABLE 1.2.3.A SUMMARY OF FLOW CONTROL PERFORMANCE CRITERIA ACCEPTABLE FOR IMPACT MITIGATION⁽¹⁾			
Downstream Problems Identified through Offsite Analysis per Core Requirement #2	AREA-SPECIFIC FLOW CONTROL FACILITY REQUIREMENT		
	Basic Flow Control (FC) Areas	Conservation FC Areas	Flood Problem FC Areas
No problem identified. Apply the minimum area-specific flow control performance criteria.	Apply the Level 1 flow control standard , which matches "existing site conditions" 2- and 10-year peaks	Apply the "historic site conditions" Level 2 flow control standard , which matches "historic" durations for 50% of 2-yr through 50-year peaks AND matches "historic" 2-, 10-, and 50-year peaks	Apply the "existing or historic site conditions" Level 2 flow control standard (whichever is appropriate based on downstream flow control area) AND match "existing site conditions" 100-year peaks
Type 1 Conveyance System Nuisance Problem	<u>Additional Flow Control</u> Hold 10-year peak to overflow T_r peak ⁽²⁾⁽³⁾	<i>No additional flow control or other mitigation is needed</i>	<i>No additional flow control or other mitigation is needed</i>
Type 2 Severe Erosion Problem	<u>Additional Flow Control</u> Apply the "existing site conditions" Level 2 flow control standard ⁽³⁾⁽⁴⁾	<i>No additional flow control is needed, but other mitigation may be required⁽⁴⁾</i>	<i>No additional flow control is needed, but other mitigation may be required⁽⁴⁾</i>
Type 3 Severe Flooding Problem	<u>Additional Flow Control</u> Apply the "existing site conditions" Level 3 flow control standard to peak flows above the overflow T_r peak. If flooding is from a closed depression, make design adjustments as needed to meet the "special provision for closed depressions" ⁽³⁾⁽⁵⁾	<u>Additional Flow Control</u> Apply the "historic site conditions" Level 3 flow control standard. If flooding is from a closed depression, make design adjustments as needed to meet the "special provision for closed depressions" ⁽³⁾⁽⁵⁾	<u>Additional Flow Control</u> If flooding is from a closed depression, make design adjustments as needed to meet the "special provision for closed depressions" ⁽³⁾⁽⁵⁾
Notes: ⁽¹⁾ More than one set of problem-specific performance criteria may apply if two or more downstream problems are identified through offsite analysis per Core Requirement #2. If this happens, the performance goals of each applicable problem-specific criteria must be met. This can require extensive, time-consuming analysis to implement multiple sets of outflow performance criteria if additional onsite flow control is the only viable option for mitigating impacts to these problems. In these cases, it may be easier and more prudent to implement the "historic site conditions" Level 3 flow control standard in place of the otherwise required area-specific standard. Use of the historic Level 3 flow control standard satisfies the specified performance criteria for all the area-specific and problem-specific requirements except if adjustments are required per the special provision for closed depressions described below in Note 5. ⁽²⁾ Overflow T_r is the return period of conveyance system overflow. To determine T_r , requires a minimum Level 2 downstream analysis as detailed in Section 2.3.1.1. To avoid this analysis, a T_r of 2 years may be assumed. ⁽³⁾ Offsite improvements may be implemented in lieu of or in combination with additional flow control as allowed in Section 1.2.2.2 (p. 1-24) and detailed in Section 3.3.5. ⁽⁴⁾ A tightline system may be required regardless of the flow control standard being applied if needed to meet the discharge requirements of Core Requirement #1 (p. 1-19) or the outfall requirements of Core Requirement #4 (p. 1-59), or is deemed necessary by DDES where the risk of severe damage is high. ⁽⁵⁾ Special Provision for Closed Depressions with a Severe Flooding Problem: IF the proposed project discharges by overland flow or conveyance system to a closed depression experiencing a severe flooding problem AND the amount of new impervious surface area proposed by the project is greater than or equal to 10% of the 100-year water surface area of the closed depression, THEN use the "point of compliance analysis technique" described in Section 3.3.6 to verify that water surface levels are not increasing for the return frequencies at which flooding occurs, up to and including the 100-year frequency. If necessary, iteratively adjust onsite flow control performance to prevent increases. <i>Note: The "point of compliance analysis" relies on certain field measurements taken directly at the closed depression (e.g., soils tests, topography, etc.). If permission to enter private property for such measurements is denied, DDES may waive this provision and apply the "existing site conditions" Level 3 flow control standard with a mandatory 20% safety factor on the storage volume.</i>			

❑ DIRECT DISCHARGE EXEMPTION

Any site **natural drainage area** is exempt from the flow control facility requirement if the area drains to one of the "major receiving waters" listed at right, AND meets the following criteria for *direct discharge*⁴² to that receiving water:

- The **flowpath** from the project site discharge point to the edge of the 100-year floodplain of the major receiving water shall be **no longer than a quarter mile**, except for discharges to Lake Sammamish, Lake Washington, and Puget Sound, AND
- The conveyance system between the project site and the ordinary high water line of the major receiving water shall be **comprised of manmade conveyance elements** (pipes, ditches, outfall protection, etc.) and shall be within public right-of-way or a public or private drainage easement, AND
- The conveyance system shall have **adequate capacity**⁴³ per Core Requirement #4, Conveyance System, for the entire contributing drainage area, assuming **build-out conditions** to current zoning for the *equivalent area* portion (defined in below) and existing conditions for the remaining area, AND
- The conveyance system will be adequately **stabilized to prevent erosion**, assuming the same basin conditions as assumed in Criteria (c) above, AND
- The direct discharge proposal will not **divert flows** from or **increase flows** to an **existing wetland or stream** sufficient to cause a significant adverse impact.

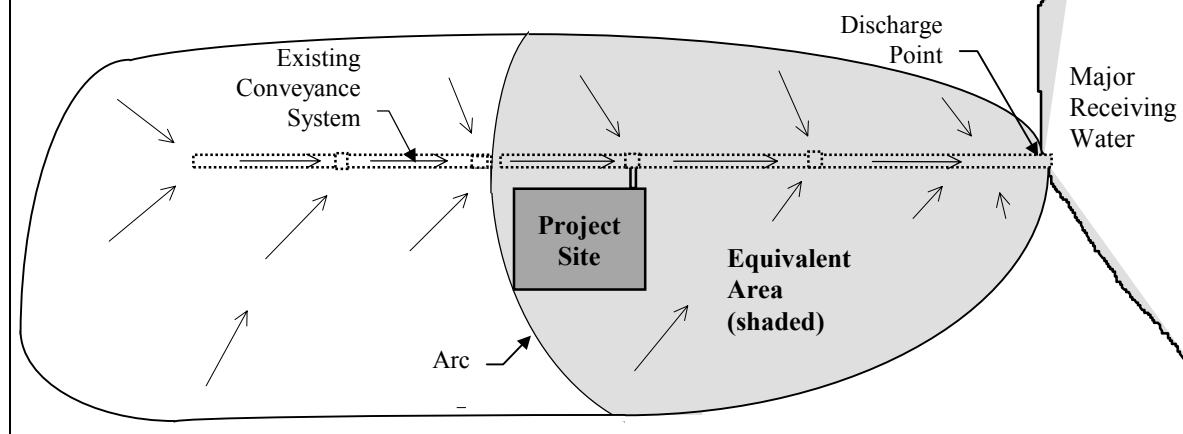
**TABLE 1.2.3.B
MAJOR RECEIVING WATERS**

- Cedar River
- Green/Duwamish River below River Mile 6 (S. Boeing Access Road) and above SR 18
- Snoqualmie River (includes the North, South, and Middle Forks)
- Sammamish River
- White/Stuck River
- Skykomish River
- Tolt River
- Lake Sammamish
- Lake Washington
- Puget Sound

Note: "Major Receiving Waters" do not include side channels, spring- or groundwater-fed streams, or wetland habitats that provide salmonid spawning or rearing habitat that may be connected or adjacent to major rivers.

FIGURE 1.2.3.A EQUIVALENT AREA DEFINITION AND ILLUSTRATION

Equivalent area: The area tributary to a direct discharge conveyance system that is contained within an arc formed by the shortest, straight line distance from the conveyance system discharge point to the furthestmost point of the proposed project.



⁴² Direct discharge means undetained discharge from a proposed project to a major receiving water.

⁴³ Note: If the conveyance system is an existing King County-owned system, the County may charge a special use fee equal to or based on the property value/replacement cost of the system capacity being used.

A. LEVEL 1 BASIC FLOW CONTROL AREAS

Basic Flow Control Areas are designated by King County where the County has determined that Level 1 flow control is a **peak-matching performance standard** primarily applied in areas where maintaining peak flows is sufficient to protect the natural and constructed conveyance systems. This designation is usually based on the findings of a plan or study that has determined that such conveyance systems are not sensitive to development-induced increases in runoff volume and durations. Basic Flow Control Areas are delineated on the Flow Control Applications Map adopted with this manual (see map pocket on inside of back cover). A more detailed delineation is available on the County's Geographic Information System.

Note: For projects located on or near the delineated boundary of the flow control area, site-specific topography or drainage information may be needed to determine whether the project or any threshold discharge area of the project is indeed within the flow control area. Any threshold discharge area is considered to be within the flow control area if the threshold discharge area drains to a waterbody or drainage system that is clearly within the mapped delineation of the flow control area.

~~that are not sensitive to development-induced increases in runoff volumes and flow durations. King County designates these areas as Level 1 Flow Control Areas. Most Level 1 Flow Control Areas are delineated on the Flow Control Applications Map adopted with this manual (see map pocket on inside of back cover). Any urban-zoned areas of unincorporated King County not shown on this map shall also be considered Level 1 Flow Control Areas.~~

Threshold

~~The Level 1 flow control standard shall be applied to the design of required flow control facilities for any proposed project which meets one of the following criteria:~~

- ~~☐ The project is located within a Level 1 Flow Control Area as defined above, OR~~
- ~~☐ The project is located within a Level 2 Flow Control Area as defined on page 1-34, but does not meet the threshold for application of the Level 2 flow control standard (see p. 1-35).~~

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Within Basic Flow Control Areas, required flow control facilities must comply with the following minimum requirements for facility performance and mitigation of targeted surfaces except where such requirements or the facility requirement altogether are waived or reduced by the area-specific exceptions at the end of this subsection.

Minimum Required Performance Criteria

Facilities in Basic Flow Control Areas must comply with the following flow control performance standards and assumptions unless modified by offsite analysis per Core Requirement #2 (see Table 1.2.3.A, p. 1-35):

Level 1 Flow Control: Match the developed peak discharge rates to the *existing site conditions*⁴⁴ peak discharge rates for 2- and 10-year return periods.

Reduced Level 1 Flow Control: A modified version of this standard, controlling only the 10-year frequency peak flow rate, is allowed if the applicant demonstrates both of the following:

- The proposed project site discharges to a conveyance system not subject to erosion that extends from the project discharge point to one of the "major receiving waters" listed in 1.2.3B (p. 1-29) on Page 1-36, AND
- There is no evidence of capacity problems along this conveyance system as determined by offsite analysis per Core Requirement #2, or such problems will be resolved prior to project construction.

⁴⁴ *Existing site conditions* is defined in footnote 45 on page 1-38.

Intent

The Level 1 flow control standard is intended to protect flow-carrying capacity and limit increased erosion within the downstream conveyance system for runoff events less than or equal to the 10-year event. Matching the 2- and 10-year peak flows is intended to prevent increases in return-frequency peak flows less than or equal to the 10-year peak flow down to the 2-year peak flow. This level of control is also intended to prevent creation of new *conveyance system nuisance problems* as defined in Section 1.2.2 (p. 1-20).

Effectiveness in Addressing Downstream Problems

While the Level 1 flow control standard provides reasonable protection from many development-induced conveyance problems (up to the 10-year event), it does not prevent increases in runoff volumes or flow durations that tend to aggravate the three types of downstream problems described in Section 1.2.2.1. Consequently, if one or more of these problems are identified through offsite analysis per Core Requirement #2, additional onsite flow control and/or offsite improvements will likely be required (see "Problem-Specific Mitigation Requirements" in Section 1.2.2.2, p. 1-25).

Target Surfaces

Facilities in Basic Flow Control Areas must mitigate (either directly or in effect) the runoff from the following target surfaces within the site threshold discharge area for which the facility is required:

1. **New impervious surface** that is not "fully dispersed" per the criteria on Page 1-48. For individual lots within residential subdivision projects, the extent of new impervious surface shall be assumed as specified in Chapter 3.
2. **New pervious surface** that is not fully dispersed. For individual lots within residential subdivision projects, the extent of new pervious surface shall be assumed to be the entire lot area, except the assumed impervious portion and any portion in which native conditions are preserved by covenant, tract, or easement. In addition, the new pervious surface on individual lots shall be assumed to be 100% grass if located within the Urban Growth Area (UGA) and 50% grass/50% pasture if located outside the UGA.

Exceptions

The following exceptions apply only in Basic Flow Control Areas:

1. The facility requirement in Basic Flow Control Areas is waived for any site threshold discharge area in which the target surfaces subject to this requirement will generate no more than a **0.1-cfs increase** in the *existing site conditions*⁴⁵ 100-year peak flow.
2. The facility requirement in Basic Flow Control Areas may be waived for any site threshold discharge area of a **single-family residential project** in which all of the following criteria are met:
 - a) The area of not-fully-dispersed **new impervious surface** is no more than 10,000 square feet, AND
 - b) The area of not-fully-dispersed **new impervious surface plus new pervious surface other than pasture** is no more than 35,000 square feet, AND

⁴⁵ Existing site conditions depend on what, if any, land conversion activity has occurred on the site since May 1979 when King County first required flow control on developments adding more than 5,000 square feet of new impervious surface. IF a drainage plan has been approved by the County since May 1979 for any land conversion activity which includes the addition of more than 5,000 square feet of new impervious surface, THEN existing site conditions are those created by the site improvements and drainage facilities constructed per the approved engineering plans. OTHERWISE, existing site conditions are those that existed prior to May 1979 as determined from aerial photographs and, if necessary, on knowledge of individuals familiar with the area. The intent is to mitigate unaddressed impacts created by site alterations or improvements, such as clearing, which have occurred since May 1979.

- c) The total area of not-fully-dispersed **new impervious surface plus new pervious surface** is no more than 2.5 acres, AND
 - d) **Flow control BMPs** are applied within the threshold discharge area as specified in Small Site Drainage Requirements (detached Appendix C), AND
 - e) The **manner in which runoff is discharged** from the project site does not create a significant adverse impact per Core Requirement #1.
3. The facility requirement in Basic Flow Control Areas may be waived for any site threshold discharge area of a **redevelopment project** in which all of the following criteria are met:
- a) The target surfaces subject to the Basic Flow Control Areas facility requirement will generate no more than a **0.4-cfs increase** in the existing site conditions 100-year peak flow for the threshold discharge area, AND
 - b) The target surfaces subject to the Basic Flow Control Areas facility requirement will generate no more than a **0.1-cfs increase** in the existing site conditions 100-year peak flow at any **natural discharge point** from the project site, AND
 - c) **Flow control BMPs** are applied within the threshold discharge area as specified in Section 1.2.3.3 (p. 1-52), AND
 - d) The proposed project improvements will not significantly impact a **severe flooding problem** or **severe erosion problem** as defined on page 1-23, AND
 - e) The **manner in which runoff is discharged** from the project site does not create a significant adverse impact per Core Requirement #1.
4. The facility requirement in Basic Flow Control Areas may be waived for any site threshold discharge area of a **single family residential project within the Urban Growth Area** if all of the criteria are met:
- a) The target surfaces subject to the Basic Flow Control Areas facility requirement will generate no more than a **0.4-cfs increase** in the existing site conditions 100-year peak flow for the threshold discharge area, AND
 - b) The surrounding area within 1/4 mile of the project site is over **75% built-out**⁴⁶ to the zoned density as of the year 1998, AND
 - c) The proposed project does not drain to a **severe flooding problem** or **severe erosion problem** as defined on page 1-23, AND
 - d) The runoff from new impervious surfaces are infiltrated or dispersed using the **flow control BMPs** specified in Appendix C, and any **native vegetated surface** assumed not to be converted for the purposes of computing the increase in 100-year peak flow must be preserved within a tract or by covenant as described in Appendix C, AND
 - e) The **manner in which runoff is discharged** from the project site does not create a significant adverse impact per Core Requirement #1.

⁴⁶ *Percent build-out* is calculated by dividing the number of existing residential dwelling units (including existing multifamily units) by the total potential number of residential dwelling units as determined from current base zoning. The total potential number of residential dwelling units is defined as the sum of (1) existing residential dwelling units, (2) existing vacant non-subdividable single family residential lots, (3) potential single family residential lots (net buildable area of subdividable parcels multiplied by the base zoning, and subtracting out any lots with existing residential dwelling units), and (4) potential multifamily dwelling units on vacant or subdividable multifamily-zoned parcels. Permanent open space areas (e.g., sensitive areas and buffers, recreational tracts) and those properties that are zoned commercial or industrial, or are publicly-owned (e.g., parks, schools, arterial roadways, stormwater tracts) shall be excluded from these calculations.

5. The facility requirement in Basic Flow Control Areas may be waived by the DDES Land Use Services Division Manager/designee or Building Services Division Manager/designee using the procedures detailed in Sections 1.4.3 and 1.4.4 of the adjustment process, if all of the following criteria are met:
- a) The catchment (defined as the tributary area to a point where the project site comprises 15% of the tributary area, or 1/4 mile downstream, whichever is greatest) is over **90% built-out** to the zoned density, AND
 - b) Eighty percent of the existing development within the catchment was **constructed prior to 1979** (as determined from aerial photos) or is otherwise without formal flow control, AND
 - c) There are no **Class 1 or 2 streams** with salmonids within 1/2 mile downstream of the project site (except streams designated as major receiving waters), AND
 - d) There are no **Class 1 wetlands** within 1/2 mile downstream of the project site, AND
 - e) There are no **severe building flooding problems** (see page 1-23) within 1 mile downstream of the project site, AND
 - f) Undetained flows from the target surfaces subject to the Basic Flow Control Areas facility requirement will generate less than a 10% increase in the 10-year peak flows to a downstream conveyance system nuisance problem (see page 1-24).

❑ LEVEL 2 FLOW CONTROL

Level 2 flow control is a ~~duration-matching performance standard~~ which is effective in preventing increases in existing erosion rates. The standard is applied in areas where the County has determined that a greater level of control is needed and will be effective in preventing severe erosion and sedimentation damage caused by development induced increases in flow durations.⁴⁷ Such areas include those draining through SAO-defined erosion hazard areas or to salmonid-bearing streams considered sensitive to increased flow durations based on County studies or resource assessments. These areas are designated by King County as **Level 2 Flow Control Areas**, and they collectively include the following five types of special defined drainage areas and/or basin plan subbasins:

1. Basin Plan Stream Protection Areas: These are subbasins in adopted basin plans where the County has determined through hydrologic modeling that increases in flow durations from future development will cause erosion and sedimentation damage to salmonid-bearing streams. They are identified as requiring increased onsite detention to prevent acceleration of in-stream channel erosion as well as sediment-generating erosion in the stream's tributary areas.

2. Rural Stream Protection Areas: These are areas not covered by basin plans that drain to relatively undisturbed high-value resource streams on the rural side of GMA urban growth boundaries. There are nine such areas originating from a group of 17 basins identified by King County as having the highest value habitat and aquatic resources from among the county's 72 basins. The 17 basins were identified through a county-wide assessment of habitat/resource values conducted in 1994 as part of the Waterways 2000 Program. Although extensive modeling has not been done to confirm the sensitivity of these streams to increased flow durations, there is a high probability they are sensitive based on County modeling of similar streams in adopted basin plans. Given this high probability and the high value of the resource, application of Level 2 flow control in these areas is warranted. The rural portions of the following nine stream basins are designated as Rural Stream Protection Areas:

- | | |
|-------------------|----------------------|
| ❑ Tokel Creek | ❑ Tolt River |
| ❑ Harris Creek | ❑ Raging River |
| ❑ Griffin Creek | ❑ Middle Green River |
| ❑ Patterson Creek | ❑ White River |

⁴⁷ *Flow duration* means the aggregate time that peak flows are at or above a particular flow rate of interest (e.g., the amount of time over the last 40 years that peak flows were at or above the 2-year flow rate).

☐ Snoqualmie River

~~In addition to the above nine basins, any rural zoned areas of the County not shown on the Flow Control Applications Map are also considered Rural Stream Protection Areas.~~

~~3. **Sensitive Slope Protection Areas:** These are areas outside of stream protection areas that drain to those SAO defined "erosion hazard areas" that are on slopes steeper than 15% (a delineation of all known SAO erosion hazard areas can be found in King County's *Sensitive Areas Map Folio*) and where the potential for future severe erosion is high based on the amount of upstream area yet to be developed. These areas require Level 2 flow control to prevent creation or aggravation of severe erosion problems.~~

~~2. **Landslide Hazard Drainage Areas:** These are areas both inside and outside of adopted basin plans which are mapped on the Landslide Hazard Drainage Areas Map adopted with this manual (see map pocket on inside of back cover) and which drain to SAO defined "landslide hazard areas" that are on slopes steeper than 15% (a delineation of known SAO landslide hazard areas can be found in King County's *Sensitive Areas Map Folio*). Because these hazard areas pose a significant threat to health and safety, Level 2 flow control is the basic area specific standard unless a tightline is provided per Core Requirement #1. If a tightline is provided, then the basic standard defaults to that required for whatever other drainage or flow control area the proposed project may occupy. For example, if the project is located within a Basin Plan Stream Protection Area or a Rural Stream Protection Area, as defined above, then Level 2 flow control would still be the basic standard.~~

~~In cases where a tightline is not provided to convey project flows through the landslide hazard area, Level 2 flow control must be implemented in a manner which infiltrates as much runoff as is feasible to prevent significant disturbance of the landslide hazard area by overland flows (see "Facility Requirement in Landslide Hazard Drainage Areas," Section 1.2.3.2, p. 1-40).~~

~~3. **Forest Production Zone:** These areas are typically steeper in slope and often drain to the County's most pristine streams. Level 2 flow control is therefore required to prevent creation or aggravation of severe erosion problems.~~

~~Most Level 2 Flow Control Areas are delineated on the **Flow Control Applications Map** adopted with this Manual (see map pocket on inside of back cover). Any forest production zone or rural zoned areas of unincorporated King County not shown on this map shall also be considered Level 2 Flow Control Areas. *Note: A more detailed delineation of Level 2 Flow Control Areas, including the five component areas described above, is available on King County's Geographic Information System (GIS).*~~

Threshold

~~The **Level 2 flow control standard** shall be applied to the design of required flow control facilities for any proposed project which is located within a Level 2 Flow Control Area as defined above, AND which is confirmed to meet one of the following criteria for application of the Level 2 flow control standard:~~

- ☐ ~~The project is located within a Basin Plan Stream Protection Area as defined above and confirmed by detailed delineation information in the applicable basin plan, OR~~
- ☐ ~~The project is located within a Rural Stream Protection Area as defined above and, in fact, drains to a natural stream within that area, OR~~
- ☐ ~~The project is located within a Sensitive Slope Protection Area as defined above and, in fact, ultimately drains over the erodible soils of a SAO defined "erosion hazard area" with slopes steeper than 15%, OR~~
- ☐ ~~The project is located within a Landslide Hazard Drainage Area as defined above and, in fact, ultimately drains over the erodible soils of a SAO defined "landslide hazard area" with slopes steeper than 15%, OR~~
- ☐ ~~The project is located within a designated Forest Production Zone.~~

Note: If the proposed project does not meet the above threshold criteria, then the Level 1 flow control standard shall apply as detailed on page 1-32.

B. CONSERVATION FLOW CONTROL AREAS

Conservation Flow Control Areas cover all of unincorporated King County except where the County has determined that control of *flow durations*⁴⁸ and peaks to *historic site conditions*⁴⁹ is not necessary to the protect or allow for restoration of water quality or habitat functions essential to salmonids. This designation is by default unless a County-approved plan or study has determined that such conveyance systems are not sensitive to development-induced increases in runoff volume and durations. Most Conservation Flow Control Areas are delineated on the Flow Control Applications Map adopted with this manual (see map pocket on inside of back cover). Any unincorporated areas of King County not shown on this map shall be assumed to be Conservation Flow Control Areas. A more detailed delineation of Conservation Flow Control Areas is available on the County's Geographic Information System.

Note: For projects located on or near the delineated boundary of the flow control area, site-specific topography or drainage information may be needed to determine whether the project or any threshold discharge area of the project is indeed within the flow control area. Any threshold discharge area is considered to be within the flow control area if the threshold discharge area drains to a waterbody or drainage system that is clearly within the mapped delineation of the flow control area. However, any threshold discharge area that drains entirely by pipe or other non-erodible conveyance to a "major receiving water" (defined on page 1-36) may be assumed to be located within and subject to the facility requirements and exceptions of a Basic Flow Control Area.

R E Q U I R E M E N T Within Conservation Flow Control Areas, required flow control facilities must comply with the following minimum requirements for facility performance and mitigation of targeted surfaces except where such requirements or the facility requirement altogether are waived or reduced by the area-specific exceptions at the end of this subsection.

Minimum Required Performance Criteria

Facilities in Conservation Flow Control Areas must comply with the following flow control performance standard and assumptions unless modified by offsite analysis per Core Requirement #2 (see Table 1.2.3.A, p. 1-35):

Level 2 Flow Control: Match developed discharge durations to predeveloped durations for the range of predeveloped discharge rates from 50% of the 2-year peak flow up to the full 50-year peak flow, assuming existing site conditions (see Footnote 36, p. 1-26) as the predeveloped condition. *Note: The peak matching criteria of Level 1 flow control must also be met.* Also match developed peak discharge rates to predeveloped peak discharge rates for 2-, 10-, and 50-year return periods. Assume **historic site conditions** as the predeveloped condition.

Intent

The Level 2 flow control standard assuming historic site conditions is intended to limit the amount of time that erosive flows are at work in generating erosion and sedimentation within natural and constructed drainage systems. Such control is effective in preventing development-induced increases in natural erosion rates and reducing existing erosion rates where they may have been increased by past development of the site. ~~prevent initiation or aggravation of erosion or stream channel instability by maintaining existing erosion rates.~~ This is accomplished by maintaining at historic predevelopment levels the aggregate time that developed flows exceed an erosion-causing threshold (i.e., 50% of the

⁴⁸ Flow duration means the aggregate time that peak flows are at or above a particular flow rate of interest (e.g., the amount of time over the last 40-50 years that peak flows were at or above the 2-year flow rate).

⁴⁹ Historic site conditions are those which existed on the site prior to any development in the Puget Sound region. For lands not currently submerged (i.e., outside the ordinary high water line of a lake, wetland, or stream), historic site conditions shall be assumed to be forest cover unless reasonable, historic, site-specific information is provided to demonstrate a different vegetation cover.

historic 2-year peak flow). Maintaining existing-natural erosion rates within streams and their tributary areas is important for preventing increases in stream channel erosion and sediment loading detrimental to fish-salmonid habitat and production. ~~Maintaining existing erosion rates on sensitive slopes is important for preventing initiation and/or aggravation of severe erosion problems.~~

Effectiveness in Addressing Downstream Problems

While the Level 2 flow control standard assuming historic site conditions provides an excellent reasonable level of protection for preventing most development-induced problems, it does not necessarily prevent increases in the existing site conditions 100-year peak flows which can aggravate *severe flooding problems* as defined in Core Requirement #2 (see page 1-23), nor does it necessarily prevent aggravation of all *severe erosion problems*. Consequently, if one or more of these problems are identified through offsite analysis per Core Requirement #2, additional onsite flow control and/or offsite improvements will likely be required (see "Problem-Specific Mitigation Requirements" in Section 1.2.2.2, p. 1-25).

Target Surfaces

Facilities in Conservation Flow Control Areas must mitigate (either directly or in effect) the runoff from the following target developed surfaces within the site threshold discharge area for which the facility is required:

1. **New impervious surface** that is not "fully dispersed" per the criteria on Page 1-48. For individual lots within residential subdivision projects, the extent of new impervious surface shall be assumed as specified in Chapter 3.
2. **New pervious surface** that is not fully dispersed. For individual lots within residential subdivision projects, the extent of new pervious surface shall be assumed to be the entire lot area, except the assumed impervious portion and any portion in which native conditions are preserved by covenant, tract, or easement. In addition, the new pervious surface on individual lots shall be assumed to be 100% grass if located within the Urban Growth Area (UGA) and 50% grass/50% pasture if located outside the UGA.
3. **Replaced impervious surface** that is not fully dispersed on a **transportation redevelopment project** in which new impervious surface is 5,000 square feet or more and totals 50% or more of the existing impervious surface within the project limits.
4. **Replaced impervious surface** that is not fully dispersed on a **non-transportation redevelopment project** in which the total of new plus replaced impervious surface is 5,000 square feet or more and whose valuation of proposed improvements (including interior improvements and excluding required mitigation improvements) exceeds 50% of the assessed value of the existing site improvements.

Exceptions

The following exceptions apply only in Conservation Flow Control Areas:

1. The facility requirement in Conservation Flow Control Areas is waived for any site threshold discharge area in which there is **no more than a 0.1-cfs difference** in the sum of developed 100-year peak flows for those target surfaces subject to this requirement and the sum of **historic site conditions** 100-year peak flows for the same surface areas.
2. The facility requirement in Conservation Flow Control Areas may be waived for any site threshold discharge area of a **single-family residential project** in which all of the following criteria are met:
 - a) The area of not-fully-dispersed **new impervious surface** is no more than 10,000 square feet, AND
 - b) The area of not-fully-dispersed **new impervious surface plus new pervious surface other than pasture** is no more than 35,000 square feet, AND

- c) The total area of not-fully-dispersed **new impervious surface plus new pervious surface** is no more than 2.5 acres, AND
 - d) **Flow control BMPs** are applied within the threshold discharge area as specified in Small Site Drainage Requirements (detached Appendix C), AND
 - e) The **manner in which runoff is discharged** from the project site does not create a significant adverse impact per Core Requirement #1.
3. The facility requirement in Conservation Flow Control Areas may be reduced or waived for any site threshold discharge area where a **County-approved plan or study** shows that a lower standard (e.g., Level 1 flow control) is sufficient or no facility is necessary to protect habitat functions essential to salmonids.
 4. The facility requirement in Conservation Flow Control Areas as applied to **replaced impervious surface** may be waived if the County has adopted a plan and implementation schedule for fulfilling this requirement in **regional facilities**.
 5. The facility requirement in Conservation Flow Control Areas as applied to **replaced impervious surface** may be waived by the DDES Land Use Services Division Manager/designee or Building Services Division Manager/designee using the procedures detailed in Sections 1.4.3 and 1.4.4 of the adjustment process, if the flow control facility **cost to mitigate** these surfaces exceeds 1/3 of the total valuation for proposed improvements (including interior improvements) or twice the cost of a facility to mitigate the same surfaces on a new development site.

C. **LEVEL 3 FLOOD PROBLEM FLOW CONTROL AREAS**

Flood Problem Flow Control Areas are designated by King County where ~~Level 3 flow control is a duration-matching and peak-matching performance standard~~ which is effective in preventing significant increases in water surface levels of lakes, wetlands, and closed depressions. The standard is primarily applied in areas that drain to certain lakes, wetlands, or closed depressions where the County has determined that a higher average level of flow control is needed to prevent aggravation of existing documented flooding problems. ~~the County has designated such areas as Level 3 Flow Control Areas.~~ Note that these areas are not specifically delineated on the Flow Control Applications Map (located inside the back cover of this manual), ~~but they and~~ are also listed on the map by name of lake, wetland code number (from the *King County Wetlands Inventory*), or approximate address. A more detailed delineation of Flood Problem Flow Control Areas is available on the County's Geographic Information System.

Note: For projects located on or near the delineated boundary of the flow control area, site-specific topography or drainage information may be needed to determine whether the project or any threshold discharge area of the project is indeed within then flow control area. Any threshold discharge area is considered to be within the flow control area if the threshold discharge area drains to a waterbody or drainage system that is clearly within the mapped delineation of the flow control area.

Threshold

The ~~Level 3 flow control standard~~ shall be applied to the design of required flow control facilities for any proposed project which is located within the contributing drainage area of one of the County-inventoried wetlands or lakes listed on the Flow Control Applications (FCA) Map.

Note: If the proposed project does not meet the above threshold criteria, then apply the area-specific standard for the flow control area in which the project is located as indicated on the FCA map.

Within Flood Problem Flow Control Areas, required flow control facilities must comply with the following minimum requirements for facility performance and mitigation of targeted surfaces except where such requirements or the facility requirement altogether are waived or reduced by the area-specific exceptions at the end of this subsection.

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Minimum Required Performance Criteria

Facilities in Flood Problem Flow Control Areas must comply with the following flow control performance standard and assumptions unless modified by offsite analysis per Core Requirement #2 (see Table 1.2.3.A, p. 1-35):

Level 3 Flow Control: Apply the Level 2 flow control standard, AND match the developed 100-year peak discharge rate to the predeveloped 100-year peak discharge rate ~~for existing site conditions~~. If the Flood Problem Flow Control Area is located within a Conservation Flow Control Area and does not drain entirely by pipe or other non-erodible conveyance to a major receiving water (defined on page 1-36), then historic site conditions shall be assumed as the predeveloped condition except for the purposes of matching 100-year peak discharge rates. For all other situations and for the purposes of matching 100-year peak discharge rates, existing site conditions may be assumed. *Note: The peak-matching criteria of Level 1 flow control must also be met.*

Intent

The Level 3 flow control standard is intended to prevent significant increases in existing water surface levels for 2-year through 100-year return frequencies. Such increases are expected to occur as the volume of runoff discharging to the water body is increased by upstream development. Because inflow rates to these water bodies are typically much higher than the outflow rates, increased runoff volumes from upstream development are, in effect, stacked on top of existing volumes in the water body, resulting in higher water surface levels. The duration-matching and 100-year peak-matching criteria of the Level 3 flow control standard counteract this stacking effect by slowing the arrival of additional runoff volumes. Because of its ability to prevent significant aggravation of existing flooding, the Level 3 standard is also applicable to other flow control areas where severe flooding problems have been identified per Core Requirement #2.

Effectiveness in Addressing Downstream Problems

If the Level 3 flow control standard is implemented onsite, no additional measures are required to prevent aggravation of the three types of downstream problems defined in Core Requirement #2. The one exception is when the wetland or lake is a closed depression with a severe flooding problem, and the proposed project is adding impervious surface area amounting to more than 10% of the 100-year water surface area of the closed depression. In this case, additional onsite flow control or offsite improvements may be necessary as determined by a "point of compliance analysis" (see "Special Provision for Closed Depressions" in Table 1.2.3.A (p. 1-35), and see Section 3.3.6, "Point of Compliance Analysis").

Target Surfaces

Facilities in Flood Problem Flow Control Areas must mitigate (either directly or in effect) the runoff from the following target developed surfaces within the site threshold discharge area for which the facility is required:

1. If the Flood Problem Flow Control Area is located within a Conservation Flow Control Area and does not drain entirely by pipe or other non-erodible conveyance to a major receiving water, then the target surfaces are the same as those required for facilities in Conservation Flow Control Areas (see p. 1-42) unless otherwise allowed by the area-specific exceptions for Conservation Flow Control Areas.
2. If the Flood Problem Flow Control Area is not located within a Conservation Flow Control Area or drains entirely by pipe or other non-erodible conveyance to a major receiving water, then the target surfaces are the same as those required for facilities in Basic Flow Control Areas (see p. 1-37).

Exceptions

The following exceptions apply only **in Flood Problem Flow Control Areas**:

1. If the Flood Problem Flow Control Area is **located within a Conservation Flow Control Area** and does not drain entirely by pipe or other non-erodible conveyance to a major receiving water, then the facility requirement is waived for any site threshold discharge area in which there is no more than a **0.1-cfs difference** in the sum of developed 100-year peak flows for the target surfaces subject to this requirement and the sum of **historic site conditions** 100-year peak flows for the same surface areas.
2. If the Flood Problem Flow Control Area is **not located within a Conservation Flow Control Area** or drains entirely by pipe or other non-erodible conveyance to a major receiving water, then the facility requirement is waived for any site threshold discharge area in which the target surfaces subject to this requirement will generate no more than a **0.1-cfs increase** in the **existing site conditions** 100-year peak flow.
3. The facility requirement in Flood Problem Flow Control Areas may be waived for any site threshold discharge area of a **single-family residential project** in which all of the following criteria are met:
 - a) The **area cleared** to accommodate the proposed project is less than 35% or less than 2 acres of the threshold discharge area (whichever is greater), AND
 - b) The area of **new impervious surface** not fully dispersed is no more than 10,000 square feet, AND
 - c) The area of **new pervious surface** not fully dispersed is no more than 35,000 square feet, AND
 - d) **Flow control BMPs** are applied within the threshold discharge area as specified in Small Site Drainage Requirements (detached Appendix C), AND
 - e) The **manner in which runoff is discharged** from the project site does not create a significant adverse impact per Core Requirement #1.
4. Any required application of the Flood Problem Flow Control Areas facility requirement to **replaced impervious surface** may be waived if the County has adopted a plan and implementation schedule for fulfilling this requirement in **regional facilities**.
5. Any required application of the Flood Problem Flow Control Areas facility requirement to **replaced impervious surface** may be waived by the DDES Land Use Services Division Manager/designee or Building Services Division Manager/designee using the procedures detailed in Sections 1.4.3 and 1.4.4 of the adjustment process, if the flow control facility **cost to mitigate** these surfaces exceeds 1/3 of the total valuation for proposed improvements (including interior improvements) or twice the cost of a facility to mitigate the same surfaces on a new development site.
6. Any required application of the Flood Problem Flow Control Areas facility requirement to **replaced impervious surface** may assume existing site conditions as the predeveloped condition for the purposes of **matching the developed 100-year peak** discharge rate to the predeveloped 100-year peak discharge rate.
7. Any site threshold discharge area that drains by pipe or other non-erodible conveyance to a **major receiving water** may be assumed to be located within and subject to the facility requirements and exceptions of a Basic Flow Control Area.

1.2.3.2 FLOW CONTROL FACILITY IMPLEMENTATION REQUIREMENTS

Flow control facilities shall be designed and implemented in accordance with the following requirements, allowances, and flexible compliance provisions:

A. ONSITE VS. OFFSITE IMPLEMENTATION

All required flow control facilities must be implemented onsite except where the below requirements can be met for direct discharge to a regional or shared facility constructed to provide flow control for the proposed project. Regional facilities are typically constructed as part of a County-approved plan or study (e.g., basin plan, stormwater compliance plan, or master drainage plan). Shared facilities may be constructed under a County-developed shared facility drainage plan or under an agreement between two or more private developers.

1. The regional or shared facility must be of adequate size and design to meet the **current** flow control requirements for the proposed project's ~~increased surface and storm water runoff~~. *Note: the current flow control requirements are those specified by Core Requirement #3 of this manual unless superseded by other adopted area-specific flow control requirements per Special Requirement #1 (see Section 1.3.1).* In some cases where the current flow control requirements differ from those used to originally design the regional or shared facility, additional analysis and possible retrofitting of the facility may be required to ensure adequate size and design. In other cases where the current flow control requirements are not significantly different or are less stringent, adequate size and design may already be documented by an adopted King County basin plan or master drainage plan, an approved shared facility drainage plan, or a detailed drainage analysis approved by the County for a separate permitted development.
2. The regional or shared facility must be fully operational at the time of construction of the proposed project. In the case of a shared facility, the proposed project must comply with the terms and conditions of all contracts, agreements, and permits associated with the shared facility. If the offsite facility is an existing King County-owned facility, the County may charge a special use fee equal to or based on the property value of the detention capacity being used.
3. The conveyance system between the project site and the regional facility must meet the same criteria specified for direct discharge to a major receiving water except for Criterion (a) (see "Direct Discharge Exemption" on page 1-36). In the case of a shared facility, the criteria are the same, except the conveyance system need only have adequate capacity and erosion protection for buildout of the *participating portion*⁵⁰ of the contributing drainage area.

B. METHODS OF ANALYSIS AND DESIGN

Flow control facilities must be analyzed and designed using a continuous flow simulation method such as HSPF (Hydrologic Simulation Program FORTRAN) or the simplified HSPF-based runoff files method. Specifications for use of the runoff files method and associated computer program, KCRTS, are found in Chapter 3. Detailed design specifications for flow control facilities are found in Chapter 5.

Land Cover Assumptions

~~Land cover assumptions for designing flow control facilities are detailed in Chapter 3. For residential development (plats, short plats, and large single family projects), flow control facilities must be sized for the ultimate potential development of the site; this assumes that all forest and shrub cover (outside of proposed impervious surface areas) will be converted to grass unless protected by an open space tract or covenant. For rural residential developments, all forest/shrub cover outside of proposed impervious surface areas will be assumed to be converted to 50% pasture and 50% grass, unless likewise protected.~~

⁵⁰ The *participating portion* includes those properties that have agreements for use of the shared facility.

Roof Downspout Controls in Subdivisions

All proposed single family residential subdivision projects must, on a lot specific basis, provide for or implement one of three types of roof downspout controls in the order of preference specified in Section 5.1. These include downspout infiltration, dispersion, or a perforated stub out connection.

C. SIZING CREDITS FOR FULLY DISPERSED SURFACES

A fully dispersed surface (either impervious or non-native pervious) is one which conforms to the BMP strategy for "full dispersion" detailed in Section 5.3.x. This strategy calls for minimizing the area of onsite developed surface relative to native vegetated surface, together with the application of dispersion techniques that utilize the natural retention/detention capacity of the native vegetated surface to mitigate the runoff effects of the developed surfaces. Developed surfaces conforming to this strategy are considered to be "non-effective surfaces" in terms of runoff changes downstream, and as such, may be modeled as "forest" and are not subject to the area-specific flow control facility requirement (Section 1.2.3.1) or the area-specific water quality facility requirement (Section 1.2.8.1). In addition, a fully dispersed impervious surface is not considered to be "effective impervious surface" for the purposes of determining compliance with the 10% effective impervious surface limit set forth in KCC 9.04.xx. In order for developed surfaces to qualify as fully dispersed, they must meet the basic criteria listed below and further detailed in Section 5.3.x.

Criteria for Fully Dispersed Surfaces

1. The **total area of impervious surface** being fully dispersed must be no more than 15% of the total area of **native vegetated surface**⁵¹ being preserved by tract, easement, or covenant within the same threshold discharge area. The total area of **impervious surface plus non-native pervious surface**⁵² being fully dispersed must be no more than 35% of a threshold discharge area.
2. The runoff from a fully dispersed surface must be discharged using one of the following **dispersion devices** in accordance with the design specifications and maximum area of fully dispersed surface for each device set forth in Section 5.3.x.
 - a) Splash blocks
 - b) Rock pads
 - c) Dispersion trenches
 - d) Sheet flow

Note: The dispersion device must be situated so as to discharge within the same threshold discharge area of the surface it serves.

3. A **native vegetated flowpath segment** of at least 100 feet in length (25 feet for sheet flow from a non-native pervious surface) must be available along the flowpath that runoff would follow upon discharge from a dispersion device listed in Minimum Requirement 2 above. The native vegetated flowpath segment **must meet all of the following criteria:**
 - a) The flowpath segment must be over **native vegetated surface**.
 - b) The flowpath segment must be **onsite or an offsite tract or easement area** reserved for such dispersion.
 - c) The **slope** of the flowpath segment must be **no steeper than 15%** for any 20-foot reach of the flowpath segment.
 - d) The flowpath segment must be located **between the dispersion device and any downstream drainage feature** such as a pipe, ditch, stream, river, pond, lake, or wetland.

⁵¹ See the definition of *native vegetated surface* on page 1-4

⁵² *Non-native pervious surface* means a pervious surface that does not meet the definition of a native vegetated surface.

- e) The flowpath segments for adjacent dispersion devices must comply with the **minimum spacing requirements** in Section 5.3.x. These requirements do not allow overlap of flowpath segments, except in the case where **sheet flow from a non-native pervious surface** overlaps with the flowpath of any dispersion device listed in Minimum Requirement 2 above. In this case, the longest of the two overlapping flowpath segments must be extended at least 1 foot for every 3 feet of distance along the most representative path that runoff would travel from the upstream end to the discharge end of the non-native pervious surface.
4. On **sites with septic systems**, the discharge of runoff from dispersion devices must not be upgradient of the drainfield. This requirement may be waived by the DDES if site topography clearly prohibits flows from intersecting the drainfield.
5. The dispersion of runoff must not create **flooding or erosion impacts** as determined by the DDES. If runoff is proposed to be discharged toward a landslide hazard area, erosion hazard area, or steep slope hazard area (i.e., slopes steeper than 20%), DDES may require the parcel owner to have the proposal evaluated by a geotechnical engineer or qualified geologist.

D. SIZING CREDITS FOR CERTAIN FLOW CONTROL BMPS

When sizing flow control facilities ~~serving single family residential subdivisions~~, the following credits may be applied:

- Where **roof runoff is infiltrated** according to the ~~requirements of design specifications in~~ Section ~~5.1-5.3.x~~, the roof area may be discounted from the net impervious area used for sizing flow control facilities.
- Where ~~roof runoff~~ **from 700 square feet or less of impervious area is dispersed by splash block, rock pad, or trench** according to the ~~requirements of design specifications in~~ Section ~~5.1-5.3.x~~ and using a vegetated flowpath segment which is (a) 50 feet or longer, (b) no steeper than 15%, (c) no closer than 25 feet from another vegetated flowpath segment, and (d) located onsite or within an offsite tract or easement area reserved for such dispersion, ~~on lots 22,000 square feet or larger, and the vegetated flowpath of the roof runoff is 50 feet or longer,~~ the ~~roof impervious~~ area may be modeled as grass surface rather than impervious surface when sizing flow control facilities.
- Where **runoff from a strip of impervious surface, 20 feet wide or less, is dispersed by sheet flow** according to the design specifications in Section 5.3.x and using a vegetated flowpath segment which is (a) 25 feet or longer, (b) no steeper than 15%, (c) no closer than 25 feet from another vegetated flowpath segment, and (d) located onsite or within an offsite tract or easement area reserved for such dispersion, the impervious surface may be modeled as grass surface rather than impervious surface when sizing flow control facilities.
- Any **modular grid pavement area that is planted with grass** and meets the design specifications in Section 5.3.x may be modeled as grass surface rather than impervious surface when sizing flow control facilities.

Note: These credits do not apply when determining eligibility for exemptions from Core Requirement #3 or exceptions from the flow control facility requirement.

E. ~~ONSITE RUNOFF MITIGATION OF~~ BYPASS AREAS

On some sites, topography may be such that it is difficult or costly to collect all target surface runoff for discharge to the onsite flow control facility. ~~Proposed~~ Therefore, some project runoff subject to flow control may bypass ~~proposed required~~ onsite flow control facilities provided that all of the following ~~are true~~ conditions are met:

1. Runoff from both the bypass area and the flow control facility **must converge within a quarter-mile downstream** of the project site discharge point, AND

2. The flow control facility ~~is~~must be designed to compensate for the uncontrolled bypass area such that the **net effect at the point of convergence** downstream is the same with or without bypass, AND
3. The increase in the existing site conditions 100-year peak discharge from the bypass area ~~will~~must not exceed 0.4 cfs, AND
4. Runoff from the bypass area ~~will~~must not create a significant adverse impact to downstream drainage systems, salmonid habitat, or properties, AND
5. **Water quality requirements** applicable to the bypass area ~~are~~must be met.

F. ~~OFFSITE BYPASS REQUIREMENT~~CONTRIBUTING AREA LIMITATION

The performance of flow control facilities can be compromised if the amount of contributing area, beyond that which must be mitigated by the facility, is too large. Therefore, if~~if~~ the existing 100-year peak flow rate from any upstream ~~offsite~~ area (not targeted for mitigation) is greater than 50% of the 100-year developed peak flow rate (undetained) for the project site area that must be mitigated, THEN the runoff from the ~~offsite-upstream~~ area must bypass ~~onsite flow control facilities~~the facility. The bypass of ~~offsite upstream~~ runoff must be designed ~~so as to achieve~~such that all of the following conditions are met:

1. Any existing **contribution of flows to an onsite wetland** must be maintained, AND
2. Offsite-Upstream flows that are naturally attenuated by the project site under predeveloped conditions must remain attenuated, either by natural means or by providing additional onsite detention so that peak flows do not increase, AND
3. Offsite-Upstream flows that are dispersed or unconcentrated on the project site under predeveloped conditions must be discharged in a safe manner as described in Core Requirement #1 under "Discharge Requirements" (p. 1-19).

G. MITIGATION TRADES

On sites where there is a significant amount of existing developed surfaces (i.e., existing impervious surface and non-native pervious surface) which are not subject to flow control, compliance with the "Contributing Area Limitation" above can require extensive piping to keep the runoff from existing and new (target) surfaces separated. To avoid such costly measures, the flow control facility for the site may be designed to mitigate an existing unmitigated developed area of equivalent size and surface characteristics as the target surface area provided that all of the following conditions are met:

1. Runoff from both the uncontrolled target surface area and the flow control facility must converge prior to discharge of the runoff from the uncontrolled target surface area onto private property without an easement or into any open drainage feature, sensitive area, or sensitive area buffer that is subject to erosion, AND
2. The net effect in terms of flow control at the point of convergence downstream must be the same with or without the mitigation trade, AND
3. Runoff from the uncontrolled target surface area must not create a significant adverse impact to downstream drainage systems, salmonid habitat, or properties prior to convergence with runoff from the flow control facility.

H. **MANIFOLD DETENTION FACILITIES**

A *manifold detention facility* is a single detention facility designed to take the place of two or more otherwise required detention facilities. It combines the runoff from two or more onsite drainage areas having separate natural discharge points, and redistributes the runoff back to the natural discharge points following detention. Because manifold detention facilities divert flows from one natural discharge point to another and then back, they are not allowed except by an approved adjustment (see Section 1.4, "Adjustment Process").

I. FACILITY REQUIREMENT IN LANDSLIDE HAZARD DRAINAGE AREAS

Proposed projects subject to Discharge Requirement 2 in Core Requirement #1 (see p. 1-20) must provide a tightline system unless the 100-year runoff from the project site can be feasibly infiltrated or one of the other exceptions listed on page 1-20 apply. For infiltration to be used as an alternative to the tightline requirement, it must be feasible per the facility design requirements and limitations specified in Section [5-45.2](#). When evaluating the feasibility of infiltration, multiple facility locations scattered throughout the project site shall be considered and used where feasible and practical to avoid concentrating infiltrated water in one location. If multiple facilities are not feasible or practical, then a single infiltration facility meeting the minimum setback requirements in Section [5-45.2](#) may be used.

Where infiltration is not feasible, [it is still possible for](#) a proposed project ~~may still to~~ qualify for one of the other exceptions to the tightline requirement specified in Core Requirement #1 (p. 1-20). If such a project is subject to [the flow control facility requirement in](#) Core Requirement #3, ~~then~~ the required ~~flow-control~~ facility must be a **detention pond** sized to meet, [at minimum, the "existing site conditions"](#) Level 2 flow control ~~performance-facility standard~~ with a safety factor of 20% applied to the storage volume. The detention pond must be sited and designed so as to maximize the opportunity for infiltration in the pond. To accomplish this, all of the following design requirements must be met:

1. The detention pond must be preceded by either a water quality treatment facility per Core Requirement #8 or a presettling basin per Section [5-45.2](#), AND
2. All detention pond side slopes must be 3H:1V or flatter and must be earthen, AND
3. Detention pond liners which impede infiltration shall not be used, AND
4. The pond bottom shall be at or above the seasonal high groundwater table, AND
5. The detention pond outflow must meet the discharge dispersal requirements specified in Discharge Requirement 1 of Core Requirement #1 (p. 1-19).

1.2.3.3 **FLOW CONTROL BMP REQUIREMENTS**

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Projects subject to Core Requirement #3 must apply **flow control BMPs** to supplement the flow mitigation provided by required flow control facilities or provide flow mitigation for developed surfaces that are too small to be practicably or effectively mitigated by a flow control facility. Flow control BMPs must be selected and applied according to the minimum requirements for one of the following project types, whichever type best matches the characteristics of the proposed project as described in subsections A, B, C, and D below:

- A. Small Lot Projects (i.e., lots <22,000 square feet)
- B. Large Lot Low Impervious Projects (i.e., lots ≥22,000 square feet and ≤45% impervious)
- C. Large Lot High Impervious Projects (i.e., lots ≥22,000 square feet and >45% impervious)
- D. Transportation Projects

Intent: The intent of flow control BMPs is to mitigate those development impacts to the natural hydrology of streams, wetlands, and lakes that cannot, in most cases, be mitigated by flow control facilities. Such impacts include the following:

- a) **Increases in runoff volumes and flashiness**, which contribute to higher and more variable stream velocities at low flows and more frequent water level fluctuations in wetlands and lakes. Such hydrologic disruption is believed to cause such things as wash-out and stranding of aquatic species, increased algal scour and washout of organic matter, loss of vegetation diversity and habitat quality, and disruption of cues for spawning, egg hatching, and migration.
- b) **Decreases in groundwater recharge**, which contributes to reductions in summer base flows critical to the habitat quality and salmonid use of smaller streams and tributaries, and mainstem side channels and wetlands used for spawning and rearing, and flood or temperature refuge.

Flow control BMPs seek to reduce imperviousness and make use of the pervious portions of development sites to maximize infiltration and retention of stormwater onsite so as to reduce runoff volumes and flashiness and increase groundwater recharge. Some flow control BMPs are more effective than others at minimizing hydrologic impacts and are given preference in the BMP requirements specified herein. For example, where substantial amounts of native vegetation are being retained onsite or within a threshold discharge area, "full dispersion" of runoff is the preferred or required BMP if it can be implemented onsite per the minimum requirements and design specifications in Section 5.3.x.

The intent of this section is to apply flow control BMPs to new and replaced impervious surfaces and new pervious surfaces to the maximum extent practicable without causing flooding or erosion impacts. The minimum levels of application specified herein are considered by the County to be a maximum extent practicable level based on best available information regarding the effectiveness of these BMPs versus their cost.

A. SMALL LOT PROJECTS

IF the proposed project (excluding offsite improvements) is contained within a legal **lot smaller than 22,000 square feet**, OR is a subdivision creating lots smaller than 22,000 square feet, THEN flow control BMPs must be applied as specified in the minimum requirements below.

Minimum BMP Requirements for Small Lot Projects

1. The feasibility and applicability of **full dispersion** as detailed in Section 5.3.x must be evaluated for the **roof area** (or an impervious area of equivalent size) on each lot. If feasible and applicable, full dispersion flow control BMPs must be implemented as part of the proposed project or provision must be made for their implementation if the project is a subdivision. Typically, such BMPs will be applicable only in clustered subdivisions where substantial amounts of forest are set aside. If this

requirement is met for the lot or all lots of the project, no other flow control BMPs are required, and the remaining requirements below are optional.

2. For those lots where full dispersion of **roof runoff** (or equivalent) is not feasible or applicable, or will cause flooding or erosion impacts, the feasibility and applicability of **roof downspout infiltration** as detailed in Section 5.3.x must be evaluated. If feasible and applicable, roof downspout infiltration must be implemented as part of the proposed project or provision must be made for its implementation if the project is a subdivision. If this requirement or the full dispersion requirement above is met for the lot or all lots of the project, no other flow control BMPs are required, and the remaining steps below are optional.
3. For those lots where full dispersion or infiltration of **roof runoff** as specified in Requirements 1 and 2 above is not feasible or applicable, or will cause flooding or erosion impacts, **one of the following BMP Options** (A or B as applicable) must be implemented as part of the proposed project or provision must be made for its implementation if the project is a subdivision. In addition, any proposed connection of roof downspouts to the local drainage system must be via a perforated stub-out connection as detailed in Section 5.3.x. This requirement (for the BMP options below plus perforated stub-out connections) may be waived or reduced on any lot where DDES determines that the requirement is not practicable or will cause flooding or erosion impacts.

Option A: Apply one or more of the following BMPs to an impervious area equal to at least 10% of the lot size for lots up to 11,000 square feet and at least 20% of the lot size for lots between 11,000 and 22,000 square feet:

- **Roof downspout dispersion** (see Section 5.3.x).
- **Bioretention** (see Section 5.3.x).
- **Rainwater harvesting** (see Section 5.3.x).
- **Vegetated roof** (see Section 5.3.x).
- **Modular grid pavement** (see Section 5.3.x).
- **Porous concrete pavement** (see Section 5.3.x), or
- **Reduction of development footprint** (see Section 5.3.x).

Option B (for subdivisions only): Apply one or a combination of the following BMPs to the entire road right-of-way within a subdivision:

- **Porous concrete sidewalks** (see Section 5.3.x).
- **Reverse slope sidewalks** (see Section 5.3.x).
- **Vegetated strip** between strips of impervious surface (see Section 5.3.x), or
- **Bioretention strip** between strips of impervious surface (see Section 5.3.x).

B. LARGE LOT LOW IMPERVIOUS PROJECTS

IF the proposed project (excluding offsite improvements) is on a **lot or lot combination**⁵³ **22,000 square feet or larger** and will result in an **impervious surface coverage of 45% or less** of the lot or lot combination, OR is a subdivision creating lots 22,000 square feet or larger that will be 45% or less impervious, THEN flow control BMPs must be applied as specified in the minimum requirements below. Examples of "large lot low impervious projects" include: rural area single family residential subdivisions and individual lot developments; rural area farms, businesses, churches, schools, parks, etc.; and urban area parks, schools, golf courses, cemeteries, and light commercial developments.

Minimum BMP Requirements for Large Lot Low Impervious Projects

1. The feasibility and applicability of **full dispersion** as detailed in Section 5.3.x must be evaluated for all new and replaced impervious surfaces and all new pervious surfaces. If feasible and applicable, full dispersion flow control BMPs must be implemented as part of the proposed project or provision must be made for their implementation if the project is a subdivision. Typically, such BMPs will be applicable to sites or portions of sites where substantial amounts of forest are set aside sufficient to meet the criteria for fully dispersing runoff from developed surfaces (see p. 1-48). If this requirement for full dispersion is met for all impervious surfaces of the project, no other flow control BMPs are required.
2. For those new and replaced impervious surfaces where full dispersion is not feasible or applicable, or will cause flooding or erosion impacts, **one or a combination of the following BMPs** must be implemented (or provision made for implementation) as needed to meet the **10% effective impervious area limit** in KCC 9.04.xx if the proposed project is located on a RA-zoned parcel:
 - **Roof downspout infiltration** (see Section 5.3.x), or
 - **Grassed modular grid pavement** (see Section 5.3.x).
3. For those impervious surfaces not addressed by Requirements 1 and 2 above, **one or more of the following BMPs** must be implemented or provision made for their implementation as detailed in Section 5.3.x. In addition, any proposed connection of roof downspouts to the local drainage system must be via a perforated stub-out connection as detailed in Section 5.3.x. This requirement (for the BMPs below plus perforated stub-out connections) may be waived or reduced where DDES determines that the requirement is not practicable or will cause flooding or erosion impacts.
 - **Basic dispersion** (see Section 5.3.x),
 - **Bioretention** (see Section 5.3.x),
 - **Rainwater harvesting** (see Section 5.3.x),
 - **Vegetated roof** (see Section 5.3.x),
 - **Modular grid pavement** (see Section 5.3.x),
 - **Porous concrete pavement** (see Section 5.3.x), or
 - **Reduction of development footprint** (see Section 5.3.x).

C. LARGE LOT HIGH IMPERVIOUS PROJECTS

IF the proposed project (excluding offsite improvements) is on a **lot or lot combination** **22,000 square feet or larger** and will result in an **impervious surface coverage of more than 45%** of the lot or lot combination, OR is a subdivision creating lots 22,000 square feet or larger that will be more than 45% impervious, THEN flow control BMPs must be applied as specified in the minimum requirements below. Examples of "large lot high impervious projects" include typical urban area commercial, multifamily, and industrial developments and commercial subdivisions.

⁵³ Lot combination means more than one legal lot comprising the "site" which contains the proposed project.

Minimum BMP Requirements for Large Lot High Impervious Projects

1. The feasibility and applicability of **full dispersion** as detailed in Section 5.3.x must be evaluated for all new and replaced impervious surfaces and all new pervious surfaces. If feasible and applicable, full dispersion flow control BMPs must be implemented as part of the proposed project or provision must be made for their implementation if the project is a subdivision. Typically, such BMPs will be applicable only on the largest of development sites where sufficient forest area is available to meet the 15% ratio of fully dispersed impervious area to native vegetated surface. If this requirement is met for a new plus replaced impervious area equal to or exceeding 45% of the lot or lot combination, no other flow control BMPs are required, and the remaining requirements below are optional.
2. For those new and replaced impervious surfaces where full dispersion as specified in Requirement 1 above is not feasible or applicable, or will cause flooding or erosion impacts, **one or more of the BMPs below** must be implemented (or provision made for their implementation) as needed to achieve application of flow control BMPs to a practicable amount of the site's impervious surface. This practicable amount is defined as follows. For projects that will result in an impervious surface coverage of more than 45% up to 65%, flow control BMPs must be applied to an impervious area equal to at least 20% of the site area or 40% of the new plus replaced impervious surface, whichever is less. For projects that will result in an impervious surface coverage of more than 65%, flow control BMPs must be applied to an impervious area equal to at least 10% of the site or 20% of the new plus replaced impervious surface, whichever is less. In addition, any proposed connection of roof downspouts to the local drainage system must be via a perforated stub-out connection as detailed in Section 5.3.x. This requirement (for the BMPs below plus perforated stub-out connections) may be waived or reduced on any lot or lot combination where DDES determines that the requirement is not practicable or will cause flooding or erosion impacts.
 - **Roof downspout infiltration** (see Section 5.3.x).
 - **Basic dispersion** (see Section 5.3.x).
 - **Bioretention** (see Section 5.3.x).
 - **Rainwater harvesting** (see Section 5.3.x).
 - **Vegetated roof** (see Section 5.3.x).
 - **Modular grid pavement** (see Section 5.3.x).
 - **Porous concrete pavement** (see Section 5.3.x), or
 - **Reduction of development footprint** (see Section 5.3.x).

D. TRANSPORTATION PROJECTS

IF the proposed project is a transportation project, THEN one or more of the following flow control BMPs should be evaluated for practicable application as part of the proposed project:

- **Porous concrete sidewalks** (see Section 5.3.x).
- **Vegetated strip** between strips of impervious surface (see Section 5.3.x).
- **Bioretention strip** between strips of impervious surface (see Section 5.3.x), or
- **Conversion to single sidewalk street** (see Section 5.3.x).

1.2.4 CORE REQUIREMENT #4: CONVEYANCE SYSTEM

R E Q U I R E M E N T

All engineered conveyance system elements for proposed projects must be analyzed, designed, and constructed to provide a minimum level of protection against overtopping, flooding, erosion, and structural failure as specified in the following groups of requirements:

- "Conveyance Requirements for New Systems", Section 1.2.4.1 (below)
- "Conveyance Requirements for Existing Systems", Section 1.2.4.2 (p. 1-57)
- "Conveyance System Implementation Requirements", Section 1.2.4.3 (p. 1-58)

Intent: To ensure proper design and construction of engineered conveyance system elements.

Conveyance systems are natural and engineered drainage facilities that collect, contain, and provide for the flow of surface and storm water. This core requirement applies to the engineered elements of conveyance systems—primarily pipes, culverts, and ditches/channels.

1.2.4.1 CONVEYANCE REQUIREMENTS FOR NEW SYSTEMS

All *new conveyance system elements*,⁵⁴ both onsite and offsite, shall be analyzed, designed, and constructed according to the following requirements. [Also see Section 4.1 for route design and easement requirements.](#)

Pipe Systems

1. New pipe systems shall be designed with sufficient capacity to convey and contain (at minimum) the 25-year peak flow, assuming developed conditions for onsite tributary areas and existing conditions for any offsite tributary areas.
2. Pipe system structures may overtop for runoff events that exceed the 25-year design capacity, provided the overflow from a 100-year runoff event does not create or aggravate a *severe flooding problem* or *severe erosion problem* as defined in Core Requirement #2, Section 1.2.2 (p. 1-35). Any overflow occurring onsite for runoff events up to and including the 100-year event must discharge at the natural location for the project site. In residential subdivisions, such overflow must be contained within an onsite drainage easement, tract, covenant, or public right-of-way.
3. The upstream end of a pipe system that receives runoff from an open drainage feature (pond, ditch, etc.) shall be analyzed and sized as a culvert as described below.

Culverts

1. New culverts shall be designed with sufficient capacity to meet the headwater requirements in Section 4.3.1 and convey (at minimum) the 25-year peak flow, assuming developed conditions for onsite tributary areas and existing conditions for any offsite tributary areas.
2. New culverts must also convey as much of the 100-year peak flow as is necessary to preclude creating or aggravating a *severe flooding problem* or *severe erosion problem* as defined in Core Requirement #2, Section 1.2.2 (p. 1-35). Any overflow occurring onsite for runoff events up to and including the 100-year event must discharge at the natural location for the project site. In residential subdivisions, such overflow must be contained within an onsite drainage easement, tract, covenant, or public right-of-way.
3. New culverts proposed in Class 1 streams or Class 2 streams with salmonids shall be designed to provide for fish passage as detailed in Section 4.3.2. *Note: The SAO or the State Department of Fish and Wildlife may require a bridge to facilitate fish passage.*

⁵⁴ *New conveyance system elements* are those that are proposed to be constructed where there are no existing constructed conveyance elements.

Ditches/Channels

1. New ditches/channels shall be designed with sufficient capacity to convey and contain, at minimum, the 25-year peak flow, assuming developed conditions for onsite tributary areas and existing conditions for any offsite tributary areas.
2. New ditches/channels must also convey as much of the 100-year peak flow as is necessary to preclude creating or aggravating a *severe flooding problem* or *severe erosion problem* as defined in Core Requirement 2, Section 1.2.2 (p. 1-35). Any overflow occurring onsite for runoff events up to and including the 100-year event must discharge at the natural location for the project site. In residential subdivisions, such overflow must be contained within an onsite drainage easement, tract, covenant, or public right-of-way.

Tightline Systems Traversing Steep Slopes

New tightline conveyance systems traversing slopes that are steeper than 15% and greater than 20 feet in height, or are a "sensitive area steep slope", shall be designed with sufficient capacity to convey and contain (at minimum) the 100-year peak flow, assuming *full build-out conditions*⁵⁵ for all tributary areas, both onsite and offsite. Tightline systems shall be designed as detailed in Section 4.2.2.

Bridges

New bridges shall be designed to pass the 100-year peak flow with clearance as specified in Section 4.3.3.

1.2.4.2 CONVEYANCE REQUIREMENTS FOR EXISTING SYSTEMS

The following conveyance requirements for existing systems are less rigorous than those for new systems to allow some salvaging of existing systems that are in useable condition. Existing systems may be utilized if they are capable of providing a minimum level of protection as-is or with minor modifications.

Existing Onsite Conveyance Systems

No Change in Flow Characteristics: Existing onsite conveyance systems that will not experience a change in flow characteristics (e.g., peak flows or volume of flows) as a result of the proposed project need not be analyzed for conveyance capacity.

Change in Flow Characteristics: Existing onsite conveyance systems that will experience a change in flow characteristics as a result of the proposed project must comply with the following conveyance requirements:

1. The existing system must be analyzed and shown to have sufficient capacity to convey and contain (at minimum) the 10-year peak flow assuming developed conditions for onsite tributary areas and existing conditions for any offsite tributary areas.
2. The applicant must demonstrate that the 100-year peak flow to the existing system will not create or aggravate a *severe flooding problem* or *severe erosion problem* as defined in Core Requirement #2, Section 1.2.2 (p. 1-35).
3. Minor modifications may be made to the conveyance system to achieve the required capacity stated above. Examples of minor modifications include raising a catch-basin rim, replacing or relaying a section of pipe to match the capacity of other pipes in the system, improving a pipe inlet, or enlarging a short, constricted reach of ditch or channel.
4. Modifications to an existing conveyance system or element which acts to attenuate peak flows due to the presence of upstream detention storage shall be made in a manner that does not significantly

⁵⁵ *Full build-out conditions* means the tributary area is developed to its full zoning potential except where there are existing sensitive areas, open space tracts, and/or native growth protection easements/covenants.

increase peak flows downstream. For example, if water is detained in a pond upstream of a restrictive road culvert, then installing an overflow system for the culvert should prevent overtopping of the road without significantly reducing existing detention storage.

Existing Offsite Conveyance Systems

1. Existing offsite conveyance systems need not be analyzed for conveyance capacity except as required by Core Requirement #2, or if offsite improvements or direct discharge are proposed per Core Requirement #3.
2. Improvements made to existing offsite conveyance systems to address the problem-specific mitigation requirements in Section 1.2.2.2 (p. 1-25) need only change existing conveyance capacity sufficient to prevent aggravation of the drainage problem(s) being addressed.
3. Existing offsite conveyance systems proposed to be used for direct discharge to a major receiving water per Core Requirement #3 (p. 1-36) shall meet the same conveyance requirements specified in Section 1.2.4.1 (p. 1-56) for new systems.

1.2.4.3 CONVEYANCE SYSTEM IMPLEMENTATION REQUIREMENTS

Conveyance systems shall be designed and implemented in accordance with the following requirements, allowances, and flexible compliance provisions:

A. METHODS OF ANALYSIS AND DESIGN

Properly-sized conveyance elements provide sufficient hydraulic capacity to convey peak flows of the return frequencies indicated in Sections 1.2.4.1 and 1.2.4.2. Conveyance capacity shall be demonstrated using the methods of analysis detailed in Chapter 4. Design flows for sizing conveyance systems shall be determined using the appropriate runoff computation method specified in Section 3.2.

B. SPILL CONTROL PROVISIONS

Projects proposing to construct or replace onsite conveyance system elements that receive runoff from non-roof-top *pollution-generating impervious surface*⁵⁶ must provide a spill control device as detailed in Section 4.2.1 prior to discharge from the project site or into a *natural onsite drainage feature*.⁵⁷ More specifically, this requirement applies whenever a proposed project does either of the following:

- Constructs a new onsite conveyance system that receives runoff from non-roof-top pollution-generating impervious surface, OR
- Removes and replaces an existing onsite conveyance system element that receives runoff from 5,000 square feet or more of non-roof-top pollution-generating impervious surface onsite.

The intent of this device is to temporarily detain oil or other floatable pollutants before they enter the downstream drainage system in the event of an accidental spill or illegal dumping. It may consist of a tee section in a manhole or catch basin, or another alternative as specified in Section 4.2.1. *Note: Spill control devices were referred to as "oil/water separation devices" in previous editions of this manual.*

⁵⁶ *Pollution-generating impervious surface* means an impervious surface considered to be a significant source of pollutants in stormwater runoff. Such surfaces include those which are subject to vehicular use or storage of erodible or leachable materials, wastes, or chemicals, and which receive direct rainfall or the run-on or blow-in of rainfall (for more details, see page 1-69). Metal roofs are also considered to be pollution-generating impervious surface unless they are treated to prevent leaching.

⁵⁷ *Natural onsite drainage feature* means a natural swale, channel, stream, closed depression, wetland, or lake.

C. COMPOSITION

Where feasible, conveyance systems shall be constructed of vegetation-lined channels, as opposed to pipe systems. Vegetative channels shall generally be considered feasible if all of the following conditions are present:

1. The channel gradient generally does not exceed five percent, AND
2. No modifications to currently adopted standard roadway cross sections in the *King County Road Standards* are necessitated by the channel, AND
3. The channel will be accessible for maintenance (see Section 1.2.6), AND
4. The channel will not be subject to erosion.

Exceptions: The following are exceptions to the requirement for vegetative channels:

- Conveyance systems proposed under roadways, driveways, or parking areas
- Conveyance systems proposed between houses in urban-zoned plats and short plats
- Conveyance systems conveying roof runoff only.

D. OUTFALLS

An *outfall* is defined as a point where collected and concentrated surface and storm water runoff is discharged from a pipe system or culvert.

Energy Dissipation: At a minimum, rock erosion protection is required at outfalls from all drainage systems and elements except where DDES determines that erosion protection is being provided by other means or is not needed. Details on outfall structures are included in Section 4.2.2.

New Point Discharges Over Steep Slopes: Proposed outfalls that will discharge runoff in a location where the natural (existing) discharge is unconcentrated over a slope steeper than 15% and greater than 20 feet in height, or over a SAO-defined steep slope hazard area, must meet the following criteria:

1. IF the 100-year peak discharge is less than or equal to 0.2 cfs⁵⁸ under existing conditions and will remain less than or equal to 0.2 cfs under developed conditions, THEN outfall runoff may be discharged onto a rock pad shaped in a manner so as to disperse flow. The outfall and rock pad must be located upstream from any landslide or steep slope buffer and no less than 50 feet from the top of a SAO-defined steep slope unless otherwise approved by DDES based on an evaluation/report by a geotechnical engineer.
2. IF the 100-year peak discharge is greater than 0.2 cfs but less than or equal to 0.5 cfs under existing conditions and will remain less than or equal to 0.5 cfs under developed conditions, THEN runoff must be conveyed to a dispersal trench or other dispersal system. The dispersal trench or system must be located upstream from any landslide or steep slope buffer and no less than 50 feet from the top of a SAO-defined steep slope unless otherwise approved by DDES based on an evaluation/report by a geotechnical engineer.
3. IF the 100-year peak discharge is greater than 0.5 cfs for either existing or developed conditions, THEN a tightline conveyance system must be constructed to convey the runoff to the bottom of the slope unless other measures are approved by DDES based on an evaluation/report by a geotechnical engineer. Tightline systems must be designed such that existing baseflow conditions are not significantly changed and adequate energy dissipation is provided at the bottom of the slope.

⁵⁸ Peak discharges shall be as computed using KCRTS as detailed in Chapter 3.

E. OUTFALLS TO THE GREEN RIVER

New stormwater outfalls or modifications to existing stormwater outfalls discharging to the Green River between River Mile 6 (South Boeing Access Road) and SR 18 are allowed *only* through the adjustment process. These outfalls must comply with requirements of the Green River Pump Operations Procedure Plan, which establishes storage volumes and release rate criteria for developments proposing to construct or modify outfalls. Copies of the plan are available from DNR.

F. INTERFLOW AND INTERCEPTION

Interflow is near-surface groundwater that moves laterally through the soil horizon following the hydraulic gradient of underlying relatively impermeable soils. When interflow is expressed on the surface, it is termed a *spring* or *seepage*. Any significant springs or seepage areas that impact a roadway or structure proposed by the project must be intercepted and directed into a conveyance system. Where roadways may impede the passage of interflow to downstream wetlands or streams, provision for passage of unconcentrated flows must be made.

G. PUMP SYSTEMS

Pump systems may be used to convey water from one location or elevation to another within the project site provided they meet the design criteria specified for such systems in Section 4.2.3 and will be privately owned and maintained.

Pump systems that discharge flows from the project site that would not have discharged by gravity flow under existing site conditions will require an approved adjustment to Core Requirement #1 (see Section 1.4, "Adjustment Process"). These pump systems will be considered only when they are the sole alternative to solving a flooding or erosion problem as defined in Section 1.2.2. Typical conditions of approval for these systems are available in Reference Section 8-J under "Adjustment Application Form and Process Guidelines".

1.2.5 CORE REQUIREMENT #5: EROSION AND SEDIMENT CONTROL

R E Q U I R E M E N T

All proposed projects that will clear, grade, or otherwise disturb the site must provide erosion and sediment controls to prevent, to the maximum extent possible/practicable, the transport of sediment and other construction-related pollutants from the project site to downstream drainage facilities, water resources, and adjacent properties. ~~To prevent sediment transport, These controls shall consist of~~ **Erosion and Sediment Control (ESC)** measures (e.g., silt fences, sediment traps, etc.) that are appropriate to the project site as described in Section 1.2.5.1, are required and shall perform as described in Section 1.2.5.2. In addition, these controls, b~~Both temporary and permanent, erosion and sediment controls~~ shall be implemented as described consistent with the requirements in Section 1.2.5.3 that apply to the proposed project.

Intent: To prevent the transport of sediment and other construction-related pollutants to streams, wetlands, lakes, drainage systems, and adjacent properties. Erosion of disturbed areas on construction sites can result in excessive sediment transport to adjacent properties and to surface waters. This s~~Sediment transport~~ can result in major adverse impacts, such as flooding due to obstructed drainage ways, smothering of salmonid spawning beds, and creation of algal blooms in lakes, and violation of State water quality standards for turbidity. In addition to sediment, other construction-related pollutants can be generated by uncovered waste materials and demolition debris, de-watering, maintenance of heavy equipment, chemical spills, oil spills, placement of concrete, and application of fertilizers and pesticides. Such pollutants can be toxic to both fish and humans and violate State water quality standards.

1.2.5.1 ESC MEASURES

All of t~~The~~ the following ESC measures shall must be provided considered for application to the project site as specified below and as further detailed in the King County *Erosion and Sediment Control (ESC) Standards*, adopted as Appendix D of this manual:

- **Clearing Limits:** Prior to any site clearing or grading, areas to remain undisturbed during project construction shall be delineated on the project's ESC plan and physically marked on the project site as specified in Appendix D. ~~At a minimum, clearing limit delineation flagging shall be provided at the edges of all sensitive area buffers.~~
- **Cover Measures:** Temporary and permanent cover measures shall be provided when necessary to protect disturbed areas. Appendix D specifies when temporary measures (e.g., plastic) versus permanent measures (e.g., grass) are required based on the time of year and the potential for precipitation. ~~Temporary cover shall be installed if an area is to remain unworked for more than seven days during the dry season (May 1 to September 30) or for more than two days during the wet season (October 1 to April 30), unless otherwise determined by the County. Any area to remain unworked for more than 30 days shall be seeded or sodded, unless the County determines that winter weather makes vegetation establishment unfeasible. During the wet season, slopes and stockpiles 3H:1V or steeper with more than 10 feet of vertical relief shall be covered if they are to remain unworked for more than 12 hours.~~ The intent of these measures is to prevent erosion by having as much area as possible covered during any period of precipitation.
- **Perimeter Protection:** ~~When necessary, p~~ Perimeter protection to filter sediment from sheet flow shall be provided downstream of **all** disturbed areas prior to upslope grading. Perimeter protection includes the use of vegetated strips, as well as more conventional constructed measures such as silt fences. Such protection shall be installed prior to upstream grading.
- **Traffic Area Stabilization:** Unsurfaced entrances, roads, and parking areas used by construction traffic shall be stabilized as specified in Appendix D to minimize erosion and tracking of sediment offsite.

- **Sediment Retention:** Surface water collected from all disturbed areas of the site shall be routed through a sediment pond or trap prior to release from the site. ~~This does not apply to, except those areas at the perimeter of the site small enough to be treated solely with perimeter protection as specified in Appendix D.~~ Sediment retention facilities shall be installed prior to grading any contributing area.
- **Surface Water ~~Controls~~Collection:** Surface water ~~controls~~ collection measures (e.g., ditches, berms, etc.) shall be installed to intercept all surface water from disturbed areas, convey it to a sediment pond or trap, and discharge it downstream of any disturbed areas. ~~However, a~~ Areas at the perimeter of the site which are small enough to be treated solely with perimeter protection do not require surface water ~~controls~~ collection. Significant sources of upstream surface water that drain onto disturbed areas shall be intercepted and conveyed to a stabilized discharge point downstream of the disturbed areas. Surface water ~~controls~~ collection measures shall be installed concurrently with or immediately following rough grading and shall be designed, constructed, and stabilized as needed to minimize erosion.
- **Surface Water Flow Control:** Surface water from disturbed areas must be routed through the project's onsite flow control facility or other provisions must made to prevent increases in the existing site conditions 2-year and 10-year runoff peaks discharging from the project site during construction.
- **Surface Water Pollution Control:** Source control BMPs applicable to project site construction activities must be implemented as specified in Appendix D of this manual and in King County's Stormwater Pollution Control Manual.
- **De-Watering Control:** The water resulting from construction site de-watering activities must be treated prior to discharge or disposed of as specified in Appendix D.
- **Dust Control:** Preventative measures to minimize wind transport of soil shall be implemented when a traffic hazard may be created or when sediment transported by wind is likely to be deposited in water resources.

1.2.5.2 ESC PERFORMANCE AND COMPLIANCE PROVISIONS

The changing conditions typical of construction sites call for frequent field adjustments of existing ESC measures or additional ESC measures in order to meet required performance. In some cases, strict adherence to specified measures may not be necessary or practicable based on site conditions or project type. The following provisions specify the minimum performance required and the circumstances under which the County may add to or vary from the ESC standards in Appendix D to meet this performance:

A. ESC PERFORMANCE

~~The above~~ ESC measures shall be applied and maintained so as to prevent, to the maximum extent ~~possible~~ practicable, the transport of sediment from the project site or into onsite wetlands, streams, or lakes. This performance is intended to be achieved through proper selection, installation, and operation of the above ESC measures as detailed in the *ESC Standards* (detached Appendix D) and approved by the County. However, the County may determine at any time during construction that such approved measures are not sufficient and additional action is required based on one of the following criteria:

1. IF a **sieve test** of storm and surface water discharges indicates that sand-sized sediment (soil particles coarser than the #200 sieve, 0.075 mm) is leaving the project site or entering onsite wetlands, streams, or lakes, THEN corrective actions and/or additional measures beyond those specified in Section 1.2.5.1 shall be implemented as deemed necessary by the County. *Note: The County can require that the ESC supervisor have a #200 sieve on site. Also, "leaving the project site" will be interpreted liberally. For example, if this criterion is applied to individual lots within a subdivision, it may, depending on the site, be appropriate to conduct the sieve test at the outlet of the drainage system rather than at the edge of the lot.*

2. IF the County determines that the condition of the construction site poses a **hazard to adjacent property** or may **adversely impact drainage facilities or water resources**, THEN additional measures beyond those specified in Section 1.2.5.1 can be required by the County.

B. FLEXIBLE COMPLIANCE

Some projects may meet the intent of Core Requirement #5 while varying from specific ESC requirements contained here and in the *ESC Standards*. If a project is designed and constructed such that it meets the intent of this core requirement, the County may determine that strict adherence to a specific ESC requirement is unnecessary; an approved adjustment (see Section 1.4) is not required in these circumstances. Certain types of projects are particularly likely to warrant this greater level of flexibility; for instance, projects on relatively flat, well drained soils, projects that are constructed in closed depressions, or projects that only disturb a small percentage of a forested site may meet the intent of this requirement with very few ESC measures. More information on intent and general ESC principles is contained in the *ESC Standards* in Appendix D.

C. ROADS AND UTILITIES

Road and utility projects often pose difficult erosion control challenges because they frequently cross surface waters and are long and narrow with limited area available to treat and store sediment-laden water. Because of these factors, road and utility projects are allowed greater flexibility in meeting the intent of Core Requirement #5 as described in the *ESC Standards*. Projects that pose a very low risk of erosion or sediment transport due to site conditions or project scope may also warrant greater flexibility.

1.2.5.3 IMPLEMENTATION REQUIREMENTS

Proposed projects must identify, install, and maintain required erosion and sediment controls consistent with the following requirements:

A. ESC PLAN

As specified in Chapter 2, all proposed projects must submit a plan for providing ESC measures. The ESC plan shall include a detailed construction sequence as proposed by the design engineer and shall identify required ESC measures. All ESC measures shall conform to the details and specifications in the *ESC Standards* unless an alternative is approved by King County (see "Alternative and Experimental Measures" in the *ESC Standards*, detached Appendix D). The ESC plan shall be accompanied by any calculations or information necessary to size ESC measures and demonstrate compliance with Core Requirement #5. The County may require large, complex projects to phase construction and to submit multiple ESC plans for the different stages of construction. Development of new ESC plans is not required for changes that are necessary during construction.

B. WET SEASON CONSTRUCTION

During the wet season (October 1 to April 30) any site with exposed soils shall be subject to the "Wet Season Requirements" contained in the *ESC Standards*. In addition to the ESC cover measures, these provisions include covering any newly-seeded areas with mulch and seeding as much disturbed area as possible during the first week of October in order to provide grass cover for the wet season.

C. CONSTRUCTION WITHIN SENSITIVE AREAS AND BUFFERS

Any construction that will result in disturbed areas on or within a stream or associated buffer, within a Class 1 or 2 wetland or associated buffer, or within 50 feet of a lake shall be subject to the "Sensitive Area Restrictions" contained in the *ESC Standards*. These provisions include phasing the project whenever possible so that construction in these areas is limited to the dry season.

D. MAINTENANCE

All ESC measures shall be maintained and reviewed on a regular basis as prescribed in the *ESC Standards*. The **applicant shall designate an ESC supervisor** who shall be responsible for maintenance and review of ESC measures and for compliance with all permit conditions relating to ESC as described in the *ESC Standards*. The ESC supervisor must be a certified Professional in Erosion and Sediment Control whose certification is recognized by King County. King County recognition of certification means that the individual has taken a King County-approved third party training program and has passed the King County-approved test for that training program. Additionally, the applicant's selection of an ESC supervisor must be approved by King County.

E. FINAL STABILIZATION

Prior to obtaining final construction approval, the site shall be stabilized, structural ESC measures (such as silt fences and sediment traps) shall be removed, and drainage facilities shall be cleaned as specified in the *ESC Standards*.

FLEXIBLE COMPLIANCE

~~Some projects may meet the intent of Core Requirement #5 while varying from specific ESC requirements contained here and in the *ESC Standards*. If a project is designed and constructed such that it meets the intent of this core requirement, the County may determine that strict adherence to a specific ESC requirement is unnecessary; an approved adjustment (see Section 1.4) is not required in these circumstances. Certain types of projects are particularly likely to warrant this greater level of flexibility; for instance, projects on relatively flat, well-drained soils, projects that are constructed in closed depressions, or projects that only disturb a small percentage of a forested site may meet the intent of this requirement with very few ESC measures. More information on intent and general ESC principles is contained in the *ESC Standards*.~~

ROADS AND UTILITIES

~~Road and utility projects often pose difficult erosion control challenges because they frequently cross surface waters and are long and narrow with limited area available to treat and store sediment-laden water. Because of these factors, road and utility projects are allowed greater flexibility in meeting the intent of Core Requirement #5 as described in the *ESC Standards*. Projects that pose a very low risk of erosion or sediment transport due to site conditions or project scope may also warrant greater flexibility.~~

F. CONSIDERATION OF OTHER REQUIRED PERMITS

Consideration should be given to the requirements and conditions which may be applied by other agencies as part of other permits required for land-disturbing activities. In particular, the following permits may be required and should be considered when implementing ESC measures:

- A **Class IV Special Forest Practices Permit** is required by the Washington State Department of Natural Resources for projects that will clear more than two acres of forest or 5,000 board feet of timber. All such clearing is also subject to the State Environmental Policy Act (RCW 43.21C) and will require SEPA review. King County assumes lead agency status for Class IV permits, and the application can be consolidated with the associated King County development permit or approval.
- A **NPDES⁵⁹ General Permit for Construction** (pursuant to the Washington State Department of Ecology's Baseline General Permit for Stormwater) is required for projects that will disturb more than five acres. The five-acre threshold applies even where the five acres are to be disturbed in phases, as long as the construction is part of a larger common plan of development or sale. Note: the 5-acre threshold may change to 1-acre in the near future.

⁵⁹ NPDES stands for National Pollutant Discharge Elimination System.

1.2.6 CORE REQUIREMENT #6: MAINTENANCE AND OPERATIONS

REQUIREMENT

Maintenance and operation of all drainage facilities is the responsibility of the applicant or property owner, except those facilities for which King County is granted an easement, tract, or right-of-way and officially assumes maintenance and operation as described below. Drainage facilities must be maintained and operated in compliance with King County maintenance standards.

Intent: To ensure that the maintenance responsibility for drainage facilities is clearly assigned and that these facilities will be properly maintained and operated in perpetuity.

Drainage Facilities to be Maintained by King County

King County will assume maintenance and operation⁶⁰ of the flow control and water quality [treatment](#) facilities and the conveyance system within improved public road right-of-way for any residential subdivision with two or more lots, and any similar development where at least two-thirds of the developed contributing area is from single family or [duplex/townhouse](#) residential structures on individual lots, except where such facilities are approved by King County to be maintained by the homeowners association.

Note: King County may assume maintenance of such facilities serving any mix of developments as part of a shared facilities plan. See Reference Section XX for more information on the County's policies regarding assumption of maintenance responsibility for shared facilities. For updates to this and other Reference Section documents, visit the King County Water and Land Resources Division web site for the Surface Water Design Manual.

King County **will assume maintenance** and operation of these facilities **two years after final construction approval** by DDES and an inspection by the County to ensure the facilities have been properly maintained and are operating as designed.

Flow control and water quality [treatment](#) facilities to be maintained and operated by King County must be located in a tract or right-of-way dedicated to King County. Access roads serving these facilities must also be located in the tract or right-of-way and must be connected to an improved public road right-of-way. Underground flow control or water quality facilities (tanks or vaults) may be allowed in private rights-of-way or roads if the easement includes provisions for facility access and maintenance.

Conveyance systems to be maintained and operated by King County must be located in a drainage easement, tract, or right-of-way granted to King County. *Note: King County does not normally assume maintenance responsibility for conveyance systems which are outside of improved public road right-of-way.*

Drainage Facilities to be Maintained by Private Parties

All privately-maintained drainage facilities must be maintained as specified in **Appendix A**, "Maintenance Requirements for Privately Maintained Drainage Facilities", and as further prescribed in **Chapter 6** for water quality facilities. A copy of the **Operation and Maintenance Manual** submitted as part of the permit application (see Section 2.3.1) shall be retained on site and shall be transferred with the property to the new owner. A log of maintenance activity indicating when cleaning occurred and where waste was disposed of shall also be kept by the owner and be available for inspection by the County. King County may inspect all privately-maintained drainage facilities for compliance with these requirements. If property owner(s) fail to maintain their facilities to the acceptable standards, the County may issue a written notice specifying the required actions. If these actions are not performed in a timely manner, the County may enter the property to perform the actions needed and bill the property owner(s) for the cost of the actions. In the event a hazard to public safety exists, written notice may not be required.

⁶⁰ King County does not assume maintenance of lot drainage systems or drainage stub-outs serving single family residential lot downspout, footing, or yard drains, nor does King County assume maintenance of those water quality facilities installed and integrated into site landscaping.

If the proposed project is a commercial, industrial, or multifamily development or redevelopment, or a single family residential building permit, a "**Declaration of Covenant**" (see Reference Section 8-F) must be recorded at the King County Office of Records and Elections prior to engineering plan approval.

If the proposed project is a **residential subdivision development**, all privately maintained conveyance systems or other drainage facilities which convey flows through private property must be located in a **drainage easement dedicated to convey surface and storm water**. Individual owners of the properties containing such easements must maintain the drainage facilities through their property. The legal instrument creating drainage easements on private property must contain language that requires a private property owner to obtain written approval from King County prior to removing vegetation (except by routine mowing) from any drainage easement containing open, vegetated drainage facilities (such as swales, channels, ditches, ponds, etc.). See "Drainage Easements" in Reference Section 8-H.

1.2.7 CORE REQUIREMENT #7: FINANCIAL GUARANTEES AND LIABILITY

R E Q U I R E M E N T

All drainage facilities constructed or modified for projects (except downspout infiltration and dispersion systems) must comply with the financial guarantee requirements in King County Ordinance 12020 and the liability requirements of King County Code 9.04.100. There are two types of financial guarantees for projects constructing or modifying drainage facilities: the drainage facilities restoration and site stabilization guarantee, and the drainage defect and maintenance guarantee.

Intent: To ensure financial guarantees are posted to sufficiently cover the cost of correcting, if necessary, incomplete or substandard drainage facility construction work, and to warrant for two years the satisfactory performance and maintenance of those newly-constructed drainage facilities to be assumed by King County for maintenance and operation. Core Requirement #7 is also intended to ensure that a liability policy is provided which protects the proponent and the County from any damages relating to the construction or maintenance of required drainage facilities by private parties.

Drainage Facilities Restoration and Site Stabilization Financial Guarantee

Prior to commencing construction, the applicant required to construct drainage facilities pursuant to the drainage requirements in this manual and KCC 9.04.050 must post a drainage facilities restoration and site stabilization financial guarantee. This guarantee must be an amount sufficient to cover the cost of corrective work on or off the site performed specifically for the given project. *Note: DDES may waive the requirement of this guarantee on projects proposing only minor modifications or improvements to the drainage system (e.g., catch basin inserts, spill control devices, pipe replacements, etc.). In addition, this guarantee may be combined with other required guarantees as allowed in Ordinance 12020.*

Before King County will release the project's drainage facilities restoration and site stabilization financial guarantee, the applicant must do the following:

1. Construct the drainage facilities
2. Receive final construction approval from DDES
3. Pay all required fees.

Drainage Defect and Maintenance Financial Guarantee

For any constructed or modified drainage facilities to be maintained and operated by King County, the applicant must do the following:

1. Post a drainage defect and maintenance financial guarantee for a period of two years (see Reference Section 8-E, "Maintenance and Defect Agreement").

2. Maintain the drainage facilities (per the maintenance standards in Appendix A) during the two-year period following posting of the drainage defect and maintenance financial guarantee.

Before King County will release the drainage defect and maintenance financial guarantee and assume maintenance and operation of drainage facilities, the applicant must do the following:

1. For plats, record the final plat.
2. For tracts containing drainage facilities to be maintained by King County and not located within the final plat, deed the tract to King County and set property corners in conformance with state surveying standards.
3. For easements containing drainage facilities to be maintained by King County and not located within the final plat, provide easement documents and set temporary survey markers to delineate the easement location.
4. Receive a final County inspection to ensure the drainage facilities have been properly maintained and are operating as designed.
5. Correct any defects noted in the final inspection.

1.2.8 CORE REQUIREMENT #8: WATER QUALITY

R E Q U I R E M E N T

All proposed projects, including redevelopment projects, must provide water quality (WQ) facilities to treat the runoff from those new and ~~or~~ replaced pollution-generating impervious surfaces and new pollution-generating pervious surfaces targeted for treatment as specified in the following sections. These facilities shall be selected from a menu of treatment facility options specified by the area-specific facility requirements ~~one of the area-specific WQ menus described~~ in Section 1.2.8.1 (p. 1-71) and implemented according to the applicable WQ implementation requirements in Section 1.2.8.2 (p. 1-82).

Intent: To require an efficient, cost-effective level of water quality treatment tailored to the sensitivities and resource protection needs of the downstream receiving water to which the project site drains, or, in the case of infiltration, protection of the receiving groundwater system.

Guide to Applying Core Requirement #8

Core Requirement #8 requires that WQ treatment facilities be provided to remove pollutants from runoff discharging from the project site in accordance with one of the four area-specific WQ menus-facility requirements found in Section 1.2.8.1 (p. 1-71). These area-specific requirements correspond to four different types of WQ treatment areas that are designated throughout unincorporated King County to target the levels of treatment to the protection needs of specific waterbodies and resources. These areas are Basic WQ Treatment Areas, Sensitive Lake WQ Treatment Areas, Resource Stream WQ Treatment Areas, and Sphagnum Bog WQ Treatment Areas.

Area-specific WQ menus are groups of facility options designed to provide levels of treatment targeted to the resource protection needs of specific areas of King County called *WQ treatment areas*. ~~There are four such~~ These areas are depicted on the WQ Applications Map adopted with this manual (see the map pocket inside the back cover).

The facility requirement for each WQ treatment area specifies an area-specific menu of treatment facility options, the target surfaces from which runoff must be treated by a facility, and any exceptions to the menu and target surfaces requirements. Each WQ treatment area has a different area-specific WQ menu as described in Section 1.2.8.1.

WQ implementation requirements are the minimum requirements for analyzing and designing WQ facilities to achieve intended performance and other protection goals.

For efficient application of Core Requirement #8, the following steps are recommended:

1. Check the exemption language on page 1-69 to determine if and/or which portions-threshold discharge areas of your project must provide WQ treatment facilities per Core Requirement #8.
2. If your project is a redevelopment project, you may apply the Basic WQ menu as described on page 1-70, irrespective of the WQ Applications Map, and proceed to Step 5 below.
3. Use the WQ Applications Map and any necessary site-specific information to determine the "WQ treatment area" where-in which your project is located. If this determination can not be made from the WQ Applications Map, a more detailed delineation of WQ treatment areas is available on King County's Geographic Information System. Keep in mind that because the basin boundaries of Sphagnum Bog WQ Treatment Areas are not delineated on the WQ Applications Map, you may find that your project is located in one of these as well as another WQ treatment area. If this happens, the requirements of the Sphagnum Bog WQ Treatment Area take precedence.
4. For the WQ treatment area identified above, determine which area-specific WQ menu applies to your project by consulting the detailed threshold information comply with the requirements of that area as specified in Section 1.2.8.1 (p. 1-71).
5. Use-Consult Section 1.2.8.2 (p. 1-82) to determine the minimum for other design requirements, allowances, and flexible compliance provisions related to ~~for~~ implementing water quality treatment.

Other Important Information about Core Requirement #8

Core Requirement #8 is the primary component of an overall water quality protection strategy required by this manual. Other requirements include the following:

- Core Requirement #4: **Conveyance System, Spill Control Provisions**, Section 1.2.4 (p. 1-58)—This provision generally applies whenever a project constructs or replaces onsite conveyance system elements that receive runoff from pollution-generating impervious surfaces. The provision requires that runoff from such impervious surfaces be routed through a spill control device prior to discharge from the project site or into a natural onsite drainage feature.
- Special Requirement #4: **Source Control**, Section 1.3.4 (p. 1-87)—This requirement applies water quality source controls from the *King County Stormwater Pollution Control Manual* to those projects proposing to develop or redevelop a commercial, industrial, or multifamily site.
- Special Requirement #5: **Oil Control**, Section 1.3.5 (p. 1-88)—This requirement applies special oil controls to those projects proposing to develop or redevelop a high-use site.

Key Definitions

- **Pollution-generating impervious surface (PGIS) Definition:** Those impervious surfaces considered to be a significant source of pollutants in stormwater runoff. Such surfaces include those which are *subject to vehicular use*⁶¹ or storage of *erodable or leachable materials, wastes, or chemicals*,⁶² and which receive direct rainfall or the run-on or blow-in of rainfall.⁶³ Metal roofs are also considered to be PGIS unless they are treated to prevent leaching.
- **Pollution-generating pervious surface (PGPS) Definition:** Any non-impervious surface with vegetative ground cover subject to use of pesticides and fertilizers. Such surfaces include, but are not limited to, the lawn and landscaped areas of residential or commercial sites, golf courses, parks, and sports fields, and County-standard grassed modular grid pavement.

❑ EXEMPTIONS FROM CORE REQUIREMENT #8

There are five possible exemptions from the requirement to provide a ~~formal~~ water quality treatment facility per Core Requirement #8:

1. Surface Area Exemption

A proposed project or any **threshold discharge area** within a project is exempt if it meets all of the following criteria:

- Less than 5,000 square feet of *new PGIS*⁶⁴ that is not fully dispersed⁶⁵ will be added, AND
- Less than 5,000 square feet of ~~contiguous PGIS~~⁶⁶ ~~will be created through any combination of new and/or plus replaced impervious surface~~ PGIS that is not fully dispersed will be created as part of a redevelopment project, AND

⁶¹ A surface, whether paved or not, shall be considered *subject to vehicular use* if it is regularly used by motor vehicles. The following are considered *regularly-used surfaces*: roads, unvegetated road shoulders, bike lanes within the traveled lane of a roadway, driveways, parking lots, unfenced firelanes, diesel equipment storage yards, and airport runways. The following are not considered regularly-used surfaces: road shoulders primarily used for emergency parking, paved bicycle pathways, bicycle lanes adjacent to unpaved or paved road shoulders primarily used for emergency parking, fenced firelanes, and infrequently used maintenance access roads.

⁶² *Erodable or leachable materials, wastes, or chemicals* are those substances which, when exposed to rainfall, measurably alter the physical or chemical characteristics of the rainfall runoff (examples include erodable soil, uncovered process wastes, manure, fertilizers, oily substances, ashes, kiln dust, garbage dumpster leakage, etc.).

⁶³ A covered parking area would be considered pollution-generating if runoff from uphill could regularly run through it, or if rainfall could regularly blow in and wet the pavement surface. The same parking area would not be included if it were enclosed by walls or if a low wall and berm prevented stormwater from being blown in or from running onto the covered area.

⁶⁴ *New PGIS* means new impervious surface (as defined on page 1-4) that is pollution-generating.

⁶⁵ Fully dispersed means that the criteria for "fully dispersed surfaces" on page 1-48 are met.

- c) Less than ~~1-acre~~^{35,000 square feet} of ~~contiguous PGPS~~^{new PGPS}⁶⁷ that is not fully dispersed will be added ~~and/or modified~~,⁶⁹ OR there is a formal agreement with King County to implement a ~~landscape management plan~~⁷⁰ for the PGPS areas on the site (or a farm management plan in the case of an agricultural land use).

2. Cost Exemption for Redevelopment Projects

A redevelopment project or any **threshold discharge area** within a redevelopment project is exempt if it meets all of the following criteria:

- a) Less than \$500,000 of total site improvements is proposed, AND
- b) Less than 5,000 square feet of new PGIS will be added, AND
- c) Less than 1 acre of contiguous PGPS will be added and/or modified, OR there is a formal agreement with King County to implement a landscape management plan for the PGPS areas.

2. Impervious Surface Exemption for Transportation Redevelopment Projects

A proposed transportation redevelopment project or any **threshold discharge area** within such a project is exempt if it meets all of the following criteria:

- a) The total new impervious surface within the project limits is less than 50% of the existing impervious surface, AND
- b) Less than 5,000 square feet of new PGIS that is not fully dispersed will be added, AND
- c) Less than 35,000 square feet of new PGPS that is not fully dispersed will be added.

3. Cost Exemption for Non-Transportation Redevelopment Projects

A proposed redevelopment project (excluding transportation redevelopment projects) or any **threshold discharge area** within such a project is exempt if it meets all of the following criteria:

- a) The total valuation of the project's proposed improvements (including interior improvements and excluding required mitigation improvements) is less than 50% of the assessed value of the existing site improvements, AND
- b) Less than 5,000 square feet of new PGIS that is not fully dispersed will be added, AND
- c) Less than 35,000 square feet of new PGPS that is not fully dispersed will be added.

3. Forested Open Space Exemption for Rural Residential Projects

Any **natural discharge area** within a proposed rural residential project (zoned RA 2.5, RA 5, RA 10, or R 20) is exempt if all of the following criteria are met:

- a) At least 65% of the unsubmerged portion⁷¹ of the natural discharge area is set aside as forested open space as specified in Section 5.2.1, AND

⁶⁶ *Contiguous PGIS* means a discrete patch of PGIS that is all together as opposed to being separated in different locations on the project site. As used in this and other exemptions, the intent is to apply Core Requirement #8 to those redevelopment projects that are replacing and/or adding enough impervious surface in one location to allow for opportune installation of a water quality facility.

⁶⁷ *Contiguous PGPS* means a patch of PGPS that is all together as opposed to being separated in different locations on the project site.

⁶⁸ *New PGPS* means new pervious surface (as defined on page 1-4) that is pollution-generating.

⁶⁹ *Modified PGPS* means any existing PGPS that is re-graded or re-contoured by the proposed project.

⁷⁰ *Landscape management plan* means a King County approved plan for defining the layout and long-term maintenance of landscaping features to minimize the use of pesticides and fertilizers, and to reduce the discharge of suspended solids and other pollutants. Guidelines for preparing landscape management plans can be found in Reference Section 4-A. Submittal requirements are detailed in Section 2.3.1.4.

⁷¹ *Unsubmerged portion* means any portion outside the ordinary high water line of streams, lakes, and wetlands.

- ~~b) The runoff from roads and driveways is dispersed through at least 100 feet of native vegetation as described in Section 5.2.1, AND~~
- ~~c) The runoff from contiguous lawn areas of 1 acre or more is dispersed through at least 25 feet of native vegetation onsite as specified in Section 1.2.8.2 (p. 1-71).~~

4. Standard Infiltration Exemption

A proposed project or any drainage area within a project is exempt if the runoff from pollution-generating pervious and impervious surfaces is infiltrated in soils with a *measured infiltration rate*⁷² of less than or equal to 9 inches per hour, except in designated *sole-source aquifer areas*⁷³ where the measured rate must be less than or equal to 2.4 inches per hour.

5. Soil Treatment Exemption

A proposed project or any drainage area within a project is exempt if the runoff from pollution-generating impervious surfaces is infiltrated in soils which meet the "groundwater protection criteria" outlined below, except where the measured infiltration rate is greater than 9 inches per hour in designated sole-source aquifer areas or areas within one-quarter-mile of a *sensitive lake*.⁷⁴

Groundwater Protection Criteria: The first 2 feet or more of the soil beneath an infiltration facility must meet one of the following specifications for general protection of groundwater:

- a) The soil must have a *cation exchange capacity*⁷⁵ greater than 5 and an *organic content*⁷⁶ greater than 0.5%, OR
- b) The soil must be composed of less than 25% gravel by weight with at least 75% of the soil passing the #4 sieve, and the portion passing the #4 sieve must meet one of the following gradations:
 - At least 50% must pass the #40 sieve and at least 2% must pass the #100 sieve, OR
 - At least 25% must pass the #40 sieve and at least 5% must pass the #200 sieve.

1.2.8.1 AREA-SPECIFIC WATER QUALITY ~~MENUS~~ FACILITY REQUIREMENTS

R E Q U I R E M E N T

Projects subject to Core Requirement #8 must provide a water quality treatment facility selected from ~~one of the four area-specific WQ treatment menus~~ a menu of treatment facility options specified by the area-specific facility requirements and exceptions for the designated WQ treatment area in which the proposed project or threshold discharge area of the proposed project is located. These WQ treatment areas are listed below, ~~whichever applies per the threshold information and their requirements and exceptions are~~ detailed in ~~this section~~ the following subsections:

- ~~☐ A. Basic Water Quality menu~~ WQ Treatment Areas
- ~~☐ B. Sensitive Lake Protection menu~~ Resource Stream WQ Treatment Areas
- ~~☐ C. Resource Stream Protection menu~~ Sensitive Lake WQ Treatment Areas
- ~~☐ D. Sphagnum Bog Protection menu~~ WQ Treatment Areas.

Exception: Redevelopment projects subject to Core Requirement #8 ~~need only apply the Basic WQ menu as described below, regardless of where they are located. Note: A higher standard may be imposed by an~~

⁷² *Measured infiltration rate* shall be as measured by the EPA method or the Double Ring Infiltrometer Method (ASTM D3385). For some soils, an infiltration rate of less than 9 inches per hour may be assumed based on a soil texture determination rather than a rate measurement. For more details, see the "Groundwater Protection" requirements in Section 5.4.1.

⁷³ *Sole-source aquifer areas* are designated by the EPA ~~and depicted on the Areas Highly Susceptible to Groundwater Contamination Map adopted as part of the King County Comprehensive Plan.~~

⁷⁴ *Sensitive lake* is a designation applied by the County to lakes that are particularly prone to eutrophication from development-induced increases in phosphorus loading. Such lakes are identified on the Water Quality Applications Map adopted with this manual (see map pocket on inside of back cover).

⁷⁵ *Cation exchange capacity* shall be tested using EPA Laboratory Method 9081.

⁷⁶ *Organic content* shall be measured on a dry weight basis using ASTM D2974.

~~adopted resource management plan through Special Requirement #1, Section 1.3.1, or the proposed project may apply a higher standard voluntarily.~~

Intent: To apply an appropriate level of water quality treatment based on the sensitivities of receiving waters for the drainage area in which the project lies. These drainage areas are identified as WQ treatment areas on the WQ Applications Map adopted with this manual. In addition to a minimum basic standard which applies broadly to most geographic areas, special menus are provided for sites within the watersheds of sensitive lakes, regionally significant stream reaches, and sphagnum bog wetlands.

~~Redevelopment projects may apply the Basic WQ menu for all WQ treatment areas because application of WQ treatment to these projects incrementally reduces existing pollutant loads and concentrations to all water bodies. This benefits sensitive as well as typical water bodies and limits the cost of stormwater treatment in areas that are already developed.~~

A. BASIC WQ TREATMENT AREAS MENU

~~The Basic WQ menu Treatment Areas are designated by is primarily applied in areas of King County where a general, cost-effective level of treatment is desired and where more intensive, targeted pollutant removal is not needed to protect receiving bodies. Such areas are designated by King County as Basic WQ Treatment Areas. Most Basic WQ Treatment Areas are delineated on the WQ Applications Map adopted with this manual (see the map pocket inside the back cover). A more detailed delineation is available on the County's Geographic Information System. The forest production zone and any other areas of unincorporated King County not shown on this map are also considered to be Basic WQ Treatment Areas. Note: The Basic WQ menu is also applied to all redevelopment projects that are subject to Core Requirement #8 regardless of the WQ treatment area in which they are located.~~

Note: For projects located on or near the delineated boundary of the WQ treatment area, site-specific topography or drainage information may be needed to determine whether the project or any threshold discharge area of the project is indeed within the WQ treatment area. Any threshold discharge area is considered to be within the Basic WQ Treatment Area if the threshold discharge area drains to a waterbody or drainage system that is clearly within the mapped delineation of the Basic WQ Treatment Area. The only exception to this is if the threshold discharge area also drains to a sphagnum bog wetland larger than 0.25 acres in size as described in Subsection D, "Sphagnum Bog WQ Treatment Areas" (p. 1-79). In this case, the requirements of Sphagnum Bog WQ Treatment Areas (i.e., required treatment menu, target surfaces, and exceptions) shall apply to the threshold discharge area.

Threshold Required Treatment Menu

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Within Basic WQ Treatment Areas, A treatment option from the **Basic WQ menu** shall be used to treat runoff from the target surfaces specified below except where such mitigation is waived or reduced by the exceptions at the end of this subsection.

~~any of the following types of proposed projects:~~

- ~~1. A project located within a Basic WQ Treatment Area as defined above, OR~~
- ~~2. A project located within another WQ treatment area but which does not meet the threshold for application of the area-specific requirement for that area, OR~~
- ~~3. A redevelopment project located in any WQ treatment area.~~

Treatment Goal and Options

The treatment goal for facility options in the **Basic WQ menu** is 80% removal of total suspended solids (TSS) for a typical rainfall year, assuming typical pollutant concentrations in urban runoff.⁷⁷ TSS is the general performance indicator for basic water quality protection because it is the most

⁷⁷ For evaluation purposes, typical concentrations of TSS in Seattle area runoff are between 30 and 100 mg/L (Table 1, "Water Quality Thresholds Decision Paper", King County Surface Water Management Division, April 1994).

obvious pollutant of concern. The Basic WQ menu includes facilities such as wetponds, combined detention/wetponds, biofiltration swales, filter strips, and sand filters. See Chapter 6 for specific facility choices and design details.

Intent

The **Basic WQ menu** is intended to be applied to both the stormwater discharges that drain to surface waters and those that infiltrate into soils which do not provide adequate groundwater protection (see Exemptions 4 and 5 from Core Requirement #8). Overall, the 80% TSS removal objective, in conjunction with special requirements for source control and high-use site controls, is expected to result in good stormwater quality for all but the most sensitive water bodies. Additional water quality treatment is indicated only for sensitive lakes, regionally-significant stream reaches, and sphagnum bog wetlands.

Target Surfaces

Facilities in **Basic WQ Treatment Areas** must mitigate (either directly or in effect) the runoff from the following target surfaces within the site threshold discharge area for which the facility is required:

1. **New PGIS** that is not "fully dispersed" per the criteria on Page 1-48. For individual lots within residential subdivision projects, the extent of new PGIS shall be assumed based on expected driveway size as approved by DDES.
2. **New PGPS** that is not fully dispersed and from which there will be a concentrated surface discharge in a natural channel or man-made conveyance system from the site. For individual lots within residential subdivision projects, the extent of new pervious surface shall be assumed to be the entire lot area, except the assumed impervious portion as specified in Chapter 3 and any portion in which native conditions are preserved by covenant, tract, or easement.
3. **Replaced PGIS** that is not fully dispersed on a **transportation redevelopment project** in which new impervious surface is 5,000 square feet or more and totals 50% or more of the existing impervious surface within the project limits.
4. **Replaced PGIS** that is not fully dispersed on a **non-transportation redevelopment project** in which the total of new plus replaced impervious surface is 5,000 square feet or more and whose valuation of proposed improvements (including interior improvements and excluding required mitigation improvements) exceeds 50% of the assessed value of the existing site improvements.

Exceptions

1. The facility requirement in **Basic WQ Treatment Areas** as applied to **replaced PGIS** may be waived if the County has adopted a plan and implementation schedule for fulfilling this requirement in **regional facilities**.
2. The facility requirement as applied to **target PGPS** may be waived if there is a good faith agreement with the King Conservation District to implement a farm management plan for agricultural uses, or DDES approves a *landscape management plan*⁷⁸ that controls solids, pesticides, and fertilizers leaving the site.

⁷⁸ *Landscape management plan* means a King County approved plan for defining the layout and long-term maintenance of landscaping features to minimize the use of pesticides and fertilizers, and to reduce the discharge of suspended solids and other pollutants. Guidelines for preparing landscape management plans can be found in Reference Section 4-A. Submittal requirements are detailed in Section 2.3.1.4.

B. RESOURCE STREAM WQ TREATMENT AREAS

Resource Stream WQ Treatment Areas are designated by King County in the tributary drainage areas of stream reaches considered to be "regionally significant" in habitat value based on studies and inventories conducted in support of watershed planning or management activities. These stream reaches are important fishery resources where substantial aggregations of fish are likely to be present all or part of the year due to the high quality of existing habitat. Most Resource Stream WQ Treatment Areas are delineated on the WQ Applications Map (see the map pocket inside the back cover). Any unincorporated areas of King County not shown on this map shall be assumed to be Resource Stream WQ Treatment Areas. A more detailed delineation of Resource Stream WQ Treatment Areas is available on the County's Geographic Information System.

Note: For projects located on or near the delineated boundary of the WQ treatment area, site-specific topography or drainage information may be needed to determine whether the project or any threshold discharge area of the project is indeed within the WQ treatment area. Any threshold discharge area is considered to be within the Resource Stream WQ Treatment Area if the threshold discharge area drains to any waterbody or drainage system that is clearly within the mapped delineation of the Resource Stream WQ Treatment Area. The only exception to this is if the threshold discharge area also drains to a sphagnum bog wetland larger than 0.25 acres in size as described in Subsection D, "Sphagnum Bog WQ Treatment Areas" (p. 1-79). In this case, the requirements of Sphagnum Bog WQ Treatment Areas (i.e., required treatment menu, target surfaces, and exceptions) shall apply to the threshold discharge area.

Required Treatment Menu

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Within Resource Stream WQ Treatment Areas, a treatment option from the **Resource Stream Protection menu** shall be used to treat runoff from the target surfaces specified below except where such mitigation is waived or reduced by the area-specific exceptions at the end of this subsection.

Treatment Goals and Options

The treatment goal for facility options in the **Resource Stream Protection menu** is 50% reduction of total zinc. Zinc is an indicator of a wider range of metals typically found in urban runoff that are potentially toxic to fish and other aquatic life. The Resource Stream Protection menu includes options for use of a basic-sized stormwater wetland, a large sand filter, or a combination of two facilities in series, one of which is either a sand filter or a Stormfilter™ (leaf compost filter). See Chapter 6 for specific facility options and designs.

Intent

Facility options in the Resource Stream Protection menu are intended to remove more metals than expected from the Basic WQ menu. Lower metal concentrations reduce the risk to fish of exposure to both chronic and acutely toxic concentrations of metals such as copper and zinc. Since the toxicity of metals depends on their concentration, this standard is most effective for sites with a larger proportion of pollution-generating impervious surface such as roadways and medium to high density subdivisions. The Resource Stream Protection menu is intended to apply to the entire tributary drainage area of the stream or stream reach identified as regionally significant. However, projects discharging directly to the major receiving waters listed on page 1-36 are excused from the additional treatment and may revert to the Basic WQ menu because concentration effects are of less concern as the overall flow volume increases.

Target Surfaces

Facilities in **Resource Stream WQ Treatment Areas** must mitigate (either directly or in effect) the runoff from the following target surfaces within the site threshold discharge area for which the facility is required:

1. New PGIS that is not "fully dispersed" per the criteria on Page 1-48. For individual lots within residential subdivision projects, the extent of new PGIS shall be assumed based on expected driveway size as approved by DDES.
2. New PGPS that is not fully dispersed and from which there will be a concentrated surface discharge in a natural channel or man-made conveyance system from the site. For individual lots within residential subdivision projects, the extent of new pervious surface shall be assumed to be the entire lot area, except the assumed impervious portion as specified in Chapter 3 and any portion in which native conditions are preserved by covenant, tract, or easement. *Note: where the runoff from target PGPS is separated from the runoff from target PGIS, the Basic WQ menu may be used in place of the Resource Stream Protection menu for treatment of runoff from the target PGPS (see the area-specific exceptions at the end of this subsection).*
3. Replaced PGIS that is not fully dispersed on a **transportation redevelopment project** in which new impervious surface is 5,000 square feet or more and totals 50% or more of the existing impervious surface within the project limits.
4. Replaced PGIS that is not fully dispersed on a **non-transportation redevelopment project** in which the total of new plus replaced impervious surface is 5,000 square feet or more and whose valuation of proposed improvements (including interior improvements and excluding required mitigation improvements) exceeds 50% of the assessed value of the existing site improvements.

Exceptions

The following exceptions apply only in **Resource Stream WQ Treatment Areas**:

1. The **Basic WQ menu** may be used in place of the Resource Stream Protection menu for any target PGIS from which runoff discharged by surface flow does not ultimately reach the stream or stream reach intended to be protected by the Resource Stream WQ Treatment Area designation.
2. The **Basic WQ menu** may be used in place of the Resource Stream Protection menu for treatment of any runoff that is infiltrated.
3. The **Basic WQ menu** may be used in place of the Resource Stream Protection menu within any threshold discharge area in which target PGIS comprises less than 10% of the threshold discharge area.
4. The **Basic WQ menu** may be used in place of the Resource Stream Protection menu for treatment of any runoff that is discharged by pipe or other man-made conveyance all the way to the ordinary high water line of a **major receiving water** (see list of major receiving waters on page 1-36).
5. The **Basic WQ menu** may be used in place of the Resource Stream Protection menu for any runoff from **target PGPS** that is treated separately from the runoff from target PGIS.
6. The facility requirement as applied to **target PGPS** may be waived altogether if there is a good faith agreement with the King Conservation District to implement a **farm management plan** for agricultural uses, or DDES approves a **landscape management plan** that controls solids, pesticides, and fertilizers leaving the site.
7. The facility requirement in Resource Stream WQ Treatment Areas as applied to **replaced PGIS** may be waived if the County has adopted a plan and implementation schedule for fulfilling this requirement in **regional facilities**.

C. SENSITIVE LAKE WQ TREATMENT AREAS PROTECTION MENU

~~The Sensitive Lake Protection-WQ Treatment Areas menu is primarily applied in areas of are designated by King County in the watersheds of that drain to lakes which have a combination of water quality characteristics and watershed development potential that makes them particularly prone to eutrophication induced by development. Such areas are designated by King County as Sensitive Lake WQ Treatment Areas and are delineated on the WQ Applications Map adopted with this manual (see the map pocket inside the back cover). A more detailed delineation is available on the County's Geographic Information System.~~

Note: For projects located on or near the delineated boundary of the WQ treatment area, site-specific topography or drainage information may be needed to determine whether the project or any threshold discharge area of the project is indeed within the WQ treatment area. Any threshold discharge area is considered to be within the Sensitive Lake WQ Treatment Area if the threshold discharge area drains to the sensitive lake itself or to any waterbody or drainage system that is clearly within the mapped delineation of the Sensitive Lake WQ Treatment Area. The only exception to this is if the threshold discharge area also drains to a sphagnum bog wetland larger than 0.25 acres in size as described in Subsection D, "Sphagnum Bog WQ Treatment Areas" (p. 1-79). In this case, the requirements of Sphagnum Bog WQ Treatment Areas (i.e., required treatment menu, target surfaces, and exceptions) shall apply to the threshold discharge area.

Threshold Required Treatment Menu

1-76

~~Within Sensitive Lake WQ Treatment Areas, a~~ treatment option from the **Sensitive Lake Protection menu** shall be used to treat runoff from the target surfaces specified below except where such mitigation is waived or reduced by the area-specific exceptions at the end of this subsection.

~~any proposed project (excluding redevelopment projects) which is located within a Sensitive Lake WQ Treatment Area as indicated on the WQ Applications Map, AND which discharges runoff in either of the following ways:~~

~~Discharges runoff by surface flow⁷⁹ to the lake in question, OR~~

~~2. Infiltrates runoff in soils having high infiltration rates⁸⁰ and located within one-quarter mile of the lake's mean high water level.~~

~~Notes:~~

~~□ If the proposed project is located within a Sensitive Lake WQ Treatment Area but does not meet the above threshold criteria, then the Basic WQ menu shall apply as detailed on page 1-70.~~

- ~~• If a lake management plan has been prepared and adopted by King County, additional treatment and/or other water quality measures may be required as specified in the plan and pursuant to Special Requirement #1, Section 1.3.1 (p. 1-77). A list of adopted lake management plans is provided in Reference Section 2-B.~~

~~□ If the project site discharges to more than one special WQ feature (i.e., a sensitive lake, regionally-significant stream reach, or sphagnum bog), the following order of precedence shall apply:~~

~~1. Sphagnum Bog Protection menu~~

~~2. Sensitive Lake Protection menu~~

~~3. Resource Stream Protection menu~~

⁷⁹ Surface flow means that which travels over land or in an open or piped conveyance system.

⁸⁰ High infiltration rates are those in excess of 9 inches per hour as measured by the EPA method or the Double Ring Infiltrometer method (ASTM D3385). These will typically be medium to coarse sand or gravel soil with low silt content. See Section 5.4.1 for information on measuring infiltration rates.

Treatment Goal and Options

The treatment goal for facility options in the Sensitive Lake Protection menu is 50% annual average total phosphorus (TP) removal assuming typical pollutant concentrations in urban runoff.⁸¹ This goal was chosen as a realistic and cost-effective level of phosphorus removal. The Sensitive Lake Protection menu includes options for using Basic WQ facilities that are sized larger, combinations of two facilities in series,⁸² or a single facility in combination with land use planning elements that reduce phosphorus. See Chapter 6 for specific facility options and design details.

Intent

A project discharging runoff via surface flow contributes phosphorus loading to a sensitive lake regardless of distance from the lake. If discharge is via infiltration through coarse soils, it is also possible that phosphorus would be transported through the ground for some distance without attenuation. This groundwater transport distance is considered to typically be no more than one-quarter mile. Therefore, onsite treatment using the **Sensitive Lake Protection menu** is required prior to infiltration within one-quarter mile of a sensitive lake. Infiltration through finer soils is expected to provide significant attenuation of TP, so the general groundwater protection criteria specified on page 1-71 under "Soil Treatment Exemption" are considered sufficient for infiltration through finer soils.

Target Surfaces

Facilities in Sensitive Lake WQ Treatment Areas must mitigate (either directly or in effect) the runoff from the following target surfaces within the site threshold discharge area for which the facility is required:

1. New PGIS that is not "fully dispersed" per the criteria on Page 1-48. For individual lots within residential subdivision projects, the extent of new PGIS shall be assumed based on expected driveway size as approved by DDES.
2. New PGPS that is not fully dispersed and from which there will be a concentrated surface discharge in a natural channel or man-made conveyance system from the site. For individual lots within residential subdivision projects, the extent of new pervious surface shall be assumed to be the entire lot area, except the assumed impervious portion as specified in Chapter 3 and any portion in which native conditions are preserved by covenant, tract, or easement. *Note: where the runoff from target PGPS is separated from the runoff from target PGIS, the Basic WQ menu may be used in place of the Sensitive Lake Protection menu for treatment of runoff from the target PGPS (see the area-specific exceptions at the end of this subsection).*
3. Replaced PGIS that is not fully dispersed on a **transportation redevelopment project** in which new impervious surface is 5,000 square feet or more and totals 50% or more of the existing impervious surface within the project limits.
4. Replaced PGIS that is not fully dispersed on a **non-transportation redevelopment project** in which the total of new plus replaced impervious surface is 5,000 square feet or more and whose valuation of proposed improvements (including interior improvements and excluding required mitigation improvements) exceeds 50% of the assessed value of the existing site improvements.

⁸¹ Phosphorus concentrations of between 0.10 and 0.50 mg/L are considered typical of Seattle area runoff (Table 1, "Water Quality Thresholds Decision paper", King County Surface Water Management Division, April 1994).

⁸² *In series* means that the entire treatment water volume flows from one facility to the other in turn.

Exceptions

The following exceptions apply only **in Sensitive Lake WQ Treatment Areas**:

1. The **Basic WQ menu** may be used in place of the Sensitive Lake Protection menu for treatment of **any runoff that is infiltrated** provided the infiltration facility is not located in soils having *high infiltration rates*⁸³ within one-quarter-mile of the lake's mean-high-water level. If the infiltration facility is located beyond the one-quarter-mile limit, the Basic WQ menu may be used regardless of the infiltration rate.
2. The **Basic WQ menu** may be used in place of the Sensitive Lake Protection menu for any runoff from **target PGPS** that is treated separately from the runoff from target PGIS.
3. The facility requirement as applied to **target PGPS** may be waived altogether if there is a good faith agreement with the King Conservation District to implement a **farm management plan** for agricultural uses, or DDES approves a **landscape management plan** that controls solids, pesticides, and fertilizers leaving the site.
4. The facility requirement in Sensitive Lake WQ Treatment Areas as applied to **replaced PGIS** may be waived if the County has adopted a plan and implementation schedule for fulfilling this requirement in **regional facilities**.

Note: If a lake management plan has been prepared and adopted by King County, additional treatment and/or other water quality measures may be required as specified in the plan and pursuant to Special Requirement #1, Section 1.3.1 (p. 1-85). A list of adopted lake management plans is provided in Reference Section 2-B.

C. RESOURCE STREAM PROTECTION MENU

The Resource Stream Protection menu is primarily applied in areas of King County that drain to stream reaches identified as "regionally significant" during King County studies and inventories conducted in support of watershed planning or management activities. These stream reaches are important fishery resources where substantial aggregations of fish are likely to be present all or part of the year. Only five regional drainage basins have been inventoried at present. The tributary drainage areas to these stream reaches are designated by King County as Resource Stream WQ Treatment Areas and are delineated on the WQ Applications Map (see the map pocket inside the back cover). As additional regionally significant stream reaches are identified, the WQ Applications Map will be updated.

Threshold

INFORM

A treatment option from the **Resource Stream Protection menu** shall be used to treat runoff from any proposed project (excluding redevelopment projects) which is located within a Resource Stream WQ Treatment Area as indicated on the WQ Applications Map, AND which discharges runoff by surface flow which ultimately reaches a regionally significant stream reach.

Notes:

☐ If the proposed project is within a Resource Stream WQ Treatment Area, but meets neither the above threshold criteria nor the criteria for application of the Sensitive Lake Protection menu (p. 1-71) or Sphagnum Bog Protection menu (p. 1-73), then the Basic WQ menu shall apply as detailed on page 1-70.

☐ If the project site discharges to more than one special WQ feature (i.e., a sensitive lake, regionally-significant stream reach, or sphagnum bog), the following order of precedence shall apply:

1. Sphagnum Bog Protection menu

⁸³ High infiltration rates are those in excess of 9 inches per hour as measured by the EPA method or the Double Ring Infiltrometer method (ASTM D3385). These will typically be medium to coarse sand or gravel soil with low silt content. See Section 5.4.1 for information on measuring infiltration rates.

~~2.Sensitive Lake Protection menu~~

~~3.Resource Stream Protection menu.~~

Treatment Goals and Options

The treatment goal for facility options in the ~~Resource Stream Protection menu~~ is 50% reduction of total zinc. ~~Zinc is an indicator of a wider range of metals typically found in urban runoff that are potentially toxic to fish and other aquatic life. The Resource Stream Protection menu includes options for use of a large sand filter or a combination of two facilities in series, one of which is either a sand filter or a leaf compost filter. See Chapter 6 for specific facility options and designs.~~

Intent

Facility options in the ~~Resource Stream Protection menu~~ are intended to remove more metals than expected from the Basic WQ menu. Lower metal concentrations reduce the risk to fish of exposure to both chronic and acutely toxic concentrations of metals such as copper and zinc. ~~The Resource Stream Protection menu is intended to apply to the entire tributary drainage area for the regionally significant stream reach.~~

D. SPHAGNUM BOG WQ TREATMENT AREASPROTECTION MENU

The Sphagnum Bog ~~Protection menu~~ WQ Treatment Areas are areas ~~is primarily applied in areas~~ of King County that **drain to sphagnum bog wetlands⁸⁴ larger than 0.25 acres in size⁸⁵**. These wetlands support unique vegetation communities, and they tend to develop in areas where water movement is minimized. Bogs are typically isolated from significant sources of surface and ground water and receive their main water supply from rainfall. Sphagnum bog wetlands are generally uncommon in the Puget Sound area; of all the inventoried wetlands in King County, only a small percentage have sphagnum bog components.⁸⁶

Only a portion of all sphagnum bog wetlands have been identified and mapped by King County. Consequently, many of these wetlands and their contributing drainage areas must be identified during wetland identification and delineation for the project site and during offsite analysis as required in Core Requirement #2. A list of identified sphagnum bog wetlands is included on the WQ Applications Map; however, if a wetland is found downstream of the project site that meets the definition of a sphagnum bog wetland, ~~this menu still applies the project site is considered to be within a Sphagnum Bog WQ Treatment Area~~ whether the wetland is listed or not.

Note: Any threshold discharge area that drains to a sphagnum bog wetland larger than 0.25 acres in size is considered to be within a Sphagnum Bog WQ Treatment Area regardless of the WQ treatment area indicated by the WQ Applications Map.

Required Treatment Menu Threshold

REQUIREMENT A treatment option from the **Sphagnum Bog Protection menu** shall be used to treat runoff from the target surfaces specified below except where such mitigation is waived or reduced by the area-specific exceptions at the end of this subsection.

⁸⁴ A *sphagnum bog wetland* is defined as a wetland dominated by sphagnum moss and which has an associated acid-loving plant community. A technical definition can be found in the Definition section.

⁸⁵ The *size* of a sphagnum bog wetland is defined by the boundaries of the sphagnum bog plant community.

⁸⁶ Approximately 3% of wetlands in the 1990 sensitive areas inventory are either sphagnum bogs or have portions of the lake or wetland with bog characteristics.

~~any proposed project which discharges runoff by surface flow to the plant community of a sphagnum bog wetland greater than 0.25 acres in size⁸⁷ as indicated on the WQ Applications Map or as identified through offsite analysis per Core Requirement #2.~~

Notes:

- ~~□ If the proposed project does not meet the threshold above, then apply the area-specific WQ menu for the WQ treatment area in which the project is located as indicated on the WQ Applications Map.~~
- ~~□ If the proposed project meets the threshold above, the Sphagnum Bog Protection menu will apply regardless of the WQ treatment area in which the project is located.~~
- ~~□ If the proposed project is a redevelopment project, the Sphagnum Bog Protection menu is not required but is highly recommended.~~

Treatment Goals and Options

The treatment goals for protection of sphagnum bog wetlands include the control of nutrients, alkalinity, and pH. Although these goals may change as additional information about these wetlands becomes available, target pollutant removals for sphagnum bog protection are currently as follows:

- Total phosphorus reduction of 50%
- Nitrate + nitrite reduction of 40%
- pH below 6.5
- Alkalinity below 10 mg/L.

Facility options to meet these goals are limited; therefore, the County discourages developments from discharging runoff to sphagnum bog wetlands. Treatment facility options include either infiltration of stormwater up to the 10-year event or a *treatment train*⁸⁸ of two or three facilities in series. One of the facilities in the train must be a sand filter. The order of facilities in the treatment train is important; see Chapter 6 for specific facility options and design details.

Intent

Sphagnum bog wetlands support unique vegetation communities that are extremely sensitive to changes in alkalinity and nutrients from surface water inputs. Treatment facility options emphasize reduction of mineral elements (alkalinity) and nutrients in the runoff. Little is known about the ability of the identified facility options to reduce alkalinity or to actually protect sphagnum-based plant communities. In addition, the effect of frequent water level changes on the sphagnum plant community is also unknown, but it could be damaging. Hence, the **Sphagnum Bog Protection menu** is expected to be changed over time as more information becomes available.

Target Surfaces

Facilities in Sphagnum Bog WQ Treatment Areas must mitigate (either directly or in effect) the runoff from the following target surfaces within the site threshold discharge area for which the facility is required:

1. New PGIS that is not "fully dispersed" per the criteria on Page 1-48. For individual lots within residential subdivision projects, the extent of new PGIS shall be assumed based on expected driveway size as approved by DDES.
2. New PGPS that is not fully dispersed and from which there will be a concentrated surface discharge in a natural channel or man-made conveyance system from the site. For individual lots within residential subdivision projects, the extent of new pervious surface shall be assumed to be the entire

⁸⁷ The size of a sphagnum bog wetland is defined by the boundaries of the sphagnum bog plant community.

⁸⁸ A *treatment train* is a combination of two or more treatment BMPs connected in series (i.e., the design water volume passes through each facility in turn).

- lot area, except the assumed impervious portion as specified in Chapter 3 and any portion in which native conditions are preserved by covenant, tract, or easement.
3. Replaced PGIS that is not fully dispersed on a **transportation redevelopment project** in which new impervious surface is 5,000 square feet or more and totals 50% or more of the existing impervious surface within the project limits.
 4. Replaced PGIS that is not fully dispersed on a **non-transportation redevelopment project** in which the total of new plus replaced impervious surface is 5,000 square feet or more and whose valuation of proposed improvements (including interior improvements and excluding required mitigation improvements) exceeds 50% of the assessed value of the existing site improvements.

Exceptions

The following exceptions apply only **in Sphagnum Bog WQ Treatment Areas**:

1. The **Basic WQ menu** may be used in place of the Sphagnum Bog Protection menu for treatment of any **runoff that is infiltrated** provided the infiltration facility is not located in soils having *high infiltration rates*⁸⁹ within one-quarter-mile of the mean-high-water level of a sensitive lake intended to be protected by the Sensitive Lake WQ Treatment Area designation. If the infiltration facility is located in such soils within the prescribed distance of such a lake, then the Sensitive Lake Protection menu shall be used.
2. The **Basic WQ menu** may be used in place of the Sphagnum Bog Protection menu for treatment of any **replaced PGIS runoff** provided the threshold discharge area containing the replaced PGIS is not also located in a Resource Stream WQ Treatment Area or a Sensitive Lake WQ Treatment Area. If it is located in one of these two WQ treatment areas, then the treatment menu corresponding to the WQ treatment area shall be applied.

*Note: Unlike other WQ treatment areas, the facility requirement for Sphagnum Bog WQ Treatment Areas as applied to target PGPS may **not** be waived through a farm or landscape management plan.*

⁸⁹ *High infiltration rates* are those in excess of 9 inches per hour as measured by the EPA method or the Double Ring Infiltrometer method (ASTM D3385). These will typically be medium to coarse sand or gravel soil with low silt content. See Section 5.4.1 for information on measuring infiltration rates.

1.2.8.2 WATER QUALITY IMPLEMENTATION REQUIREMENTS

Water quality treatment facilities shall be designed and implemented in accordance with the following requirements, allowances, and flexible compliance provisions:

A. METHODS OF ANALYSIS AND DESIGN

Water quality treatment facilities shall be analyzed and designed as detailed in Chapter 6.

B. SITING OF TREATMENT FACILITIES

Required treatment facilities shall be located so as to treat the runoff from all ~~contiguous target surfaces PGIS exceeding the threshold for application of Core Requirement #8 to redevelopment projects and all new PGIS on other projects~~, except as allowed below under "Treatment Trades" and "Untreated Discharges". ~~In addition, all runoff from 1 acre or more of new and/or modified contiguous PGPS must also be directed to a treatment facility.~~

Any other onsite or offsite runoff draining to a proposed treatment facility must be treated whether it is from a target pollution-generating surface or not. The facility must be sized for all flows/volumes entering the facility. This is because treatment effectiveness is determined in part by the total volume of runoff entering the facility.

~~TREATMENT OF PERVIOUS SURFACES~~

~~Pollution-generating pervious surfaces subject to Core Requirement #8 need only be treated using the Basic WQ menu regardless of location, except for those surfaces draining to sphagnum bog wetlands. It is also possible for the facility requirement to be waived if there is a good faith agreement with the King Conservation District to implement a farm management plan for agricultural uses, or DDES approves a landscape management plan that controls solids, pesticides, and fertilizers leaving the site.~~

~~For rural residential projects utilizing Exemption 3 on page 1-68, the runoff from contiguous lawn areas, 1 acre or larger, must be dispersed through 25-foot of native vegetation in accordance with the following criteria:~~

- ~~1. The contributing flowpath of the lawn area being dispersed must be no more than 150 feet, AND~~
- ~~2. The 25-foot minimum flowpath through native vegetation must be contained within the onsite tract or easement area being set aside as forested open space per Section 5.2.1, AND~~
- ~~3. Slopes within the 25-foot minimum flowpath through native vegetation should be no steeper than 8%. If this criteria can not be met due to site constraints, the 25-foot flowpath length must be increased 1.5 feet for each percent increase in slope above 8%.~~

C. TREATMENT TRADES

The runoff from target pollution-generating surfaces may be released untreated if an existing non-targeted pollution-generating surface~~Runoff from areas subject to water quality treatment requirements may be excused from the onsite treatment requirement if a pre-existing area of impervious surface~~ of equivalent size and pollutant characteristics lying within the same watershed or stream reach tributary area is treated on the project site. Such substitution is subject to the following restrictions:

1. The ~~pre-existing impervious~~existing non-targeted pollution-generating surface is not currently being treated, is not required to be treated by any phase of the proposed project, is not subject to NPDES or other permit requirements, and is not under a compliance order or other regulatory action, AND
2. The proposal is reviewed and approved by DDES.

D. UNTREATED DISCHARGES

If site topographic constraints are such that runoff from ~~an area~~ target pollution-generating surface must be pumped to be treated by the required water quality facility, then DDES may allow the area to be released untreated (except for those sites draining to a sphagnum bog wetland) provided that all of the following conditions are met:

1. Treatment of the constrained area by filter strip, biofiltration, or a linear sand filter is not feasible, and a "treatment trade" as described above is not possible, ~~AND~~.
2. The untreated ~~area~~ target surface is less than 5,000 square feet of new PGIS and is less than 5,000 square feet of ~~contiguous PGIS being created through any combination of new and/or replaced impervious surface as part of new plus replaced PGIS on~~ a redevelopment project.
3. Any target PGIS within the area to be released untreated shall be addressed with a landscape management plan ~~unless otherwise exempt from Core Requirement #8~~.

E. USE OF EXPERIMENTAL WATER QUALITY FACILITIES

Treatment facilities other than those identified in Chapter 6 are allowed on an experimental basis if it can be demonstrated they are likely to meet the pollutant removal goal for the applicable receiving water. Use of such facilities requires an experimental design adjustment to be approved by King County according to Section 1.4, "Adjustment Process" (p. 1-91). When sufficient data on performance has been collected and if performance is acceptable, the new facility will be added to the appropriate water quality menu for common use through a blanket adjustment or update of this manual.

F. OWNER RESPONSIBILITY FOR WATER QUALITY

Regardless of the means by which a property owner chooses to meet the water quality requirements of this manual – whether a treatment facility, a train of facilities, a treatment trade or an experimental treatment facility – it is ultimately the responsibility of the property owner to ensure that runoff from their site does not create water quality problems or degrade downstream beneficial uses. It is also ultimately the responsibility of the property owner to ensure that the discharge from their property is not in violation of State and Federal laws.

1.3 SPECIAL REQUIREMENTS

This section details the following five special drainage requirements which may apply to the proposed project depending on its location or site-specific characteristics:

- Special Requirement #1: Other Adopted Area-Specific Requirements, Section 1.3.1 (p. 1-85)
- Special Requirement #2: Floodplain/Floodway Delineation, Section 1.3.2 (p. 1-86)
- Special Requirement #3: Flood Protection Facilities, Section 1.3.3 (p. 1-87)
- Special Requirement #4: Source Control, Section 1.3.4 (p. 1-87)
- Special Requirement #5: Oil Control, Section 1.3.5 (p. 1-88).

1.3.1 SPECIAL REQUIREMENT #1: OTHER ADOPTED AREA-SPECIFIC REQUIREMENTS

This manual is one of several adopted regulations in King County which apply requirements for controlling drainage on an area-specific basis. Special District Overlays in KCC 21A.38 and areal clearing limits in KCC 16.82.150 (see Reference Sections 1 and 2-C) are examples of zoning and land use restrictions used to reduce drainage impacts in certain areas of the County. Other adopted area-specific regulations include requirements which have a more direct bearing on the drainage design of a proposed project. These regulations include the following:

- **Critical Drainage Areas (CDAs):** DNR establishes CDAs in areas where flooding and/or erosion conditions present an imminent likelihood of harm to the welfare and safety of the surrounding community. The special requirements in CDAs typically include more restrictive flow control and clearing standards. Maps showing CDA boundaries are available from DNR or DDES.
- **Master Drainage Plans (MDPs):** MDPs are comprehensive drainage plans prepared for urban planned developments (UPDs) or other large, complex projects (described in Section 1.1.2.4). Projects covered by a MDP must meet any adopted requirements specific to that plan.
- **Basin Plans (BPs):** The King County Council adopts basin plans to provide for the comprehensive assessment of resources and to accommodate growth while controlling adverse impacts to the environment. A basin plan may recommend specific land uses, regional capital projects, and special drainage requirements for future development within the basin area it covers.
- **Lake Management Plans (LMPs):** The King County Council adopts lake management plans to provide for comprehensive assessment of resources and to accommodate growth while controlling adverse impacts from nutrient loading to selected lakes. A lake management plan may recommend nutrient control through special drainage and source control requirements for proposed projects within the area it covers.
- **Shared Facility Drainage Plans (SFDPs):** SFDPs are approved by King County to allow two or more projects to share drainage facilities required by this manual. Projects covered by a SFDP must meet any specific requirements of that plan.

Threshold	Requirement
IF a proposed project is in a designated Critical Drainage Area or in an area included in an adopted master drainage plan, basin plan, lake management plan, or shared facility drainage plan . . .	THEN the proposed project shall comply with the drainage requirements of the Critical Drainage Area, master drainage plan, basin plan, lake management plan, or shared facility drainage plan, respectively.

Application of this Requirement

The drainage requirements of adopted CDAs, MDPs, BPs, LMPs, and SFDPs shall be applied in addition to the drainage requirements of this manual unless otherwise specified in the adopted regulation. Where conflicts occur between the two, the drainage requirements of the adopted area-specific regulation shall supersede those in this manual.

Examples of drainage requirements found in other adopted area-specific regulations include the following:

- More or less stringent flow control
- More extensive water quality controls
- Forest retention requirements
- Infiltration restrictions
- Groundwater recharge provisions
- Discharge to a constructed regional flow control or conveyance facility.

Adjustments to vary from the specific drainage requirements mandated by CDAs, BPs, and LMPs may be pursued through the adjustment process described in Section 1.4 of this manual.

Information on adopted basin plans can be found in Reference Section 2-B of this manual. Copies of all adopted CDAs, basin plans, and lake management plans are available from DNR or DDES.

Projects covered by SFDPs shall demonstrate that the shared facility will be available by the time of construction of the project and that all onsite requirements are met. Projects covered by a SFDP are still required to provide any onsite controls necessary to comply with drainage requirements not addressed by the shared facility.

1.3.2 SPECIAL REQUIREMENT #2: FLOODPLAIN/FLOODWAY DELINEATION

Floodplains and floodways are subject to inundation during extreme events. The 100-year floodplains are delineated in order to minimize flooding impacts to new development and to prevent aggravation of existing flooding problems by new development. Regulations and restrictions concerning development within a 100-year floodplain are found in the Sensitive Areas Ordinance.

Threshold	Requirement
IF a proposed project contains or is adjacent to a stream, lake, wetland, or closed depression, or if other King County regulations require study of flood hazards . . .	THEN the 100-year floodplain boundaries (and floodway, if available or if improvements are proposed within the 100-year floodplain) based on an approved flood hazard study (described below) shall be delineated on the site improvement plans and profiles, and on any final subdivision maps prepared for the proposed project.

Application of this Requirement

If an approved flood hazard study exists, then it may be used as the basis for delineating the floodplain and floodway boundaries provided the study was prepared in a manner consistent with this manual and other King County flood hazard regulations. If an approved flood hazard study does not exist, then one shall be prepared based on the requirements described in Section 4.4.2, "Floodplain/Floodway Analysis".

Note: The site may also be located in a channel relocation migration hazard area where any new proposed structures will have to comply with KCC 21A.24.275.

1.3.3 SPECIAL REQUIREMENT #3: FLOOD PROTECTION FACILITIES

Developing sites protected by levees, revetments, or berms requires a high level of confidence in their structural integrity and performance. Proper analysis, design, and construction is necessary to protect against the potentially catastrophic consequences if such facilities should fail.

Threshold	Requirement
<p>IF a proposed project either:</p> <ul style="list-style-type: none"> contains or is adjacent to a Class 1 or 2 stream that has an existing flood protection facility (such as a levee, revetment, or berm), OR proposes to construct a new or to modify an existing flood protection facility . . . 	<p>THEN the flood protection facilities shall be analyzed and/or designed to conform with the Federal Emergency Management Administration (FEMA) regulations (44 CFR).</p>

Application of this Requirement

The applicant is required to demonstrate conformance with FEMA regulations using the methods specified in Section 4.4.2. In addition, certain easement requirements (outlined in Section 4.1) must be met in order to allow County access for maintenance of the facility.

1.3.4 SPECIAL REQUIREMENT #4: SOURCE CONTROLS

Water quality source controls prevent rainfall and runoff water from coming into contact with pollutants, thereby reducing the likelihood that pollutants will enter public waterways and violate water quality standards and County stormwater discharge permit limits. A *Stormwater Pollution Control Manual* was prepared for citizens, businesses, and industries to identify and implement source controls for activities that often pollute water bodies. King County provides advice on source control implementation upon request. The County may, however, require mandatory source controls at any time through formal code enforcement if complaints or studies reveal water quality violations or problems.

Threshold	Requirement
<p>IF a proposed project is either:</p> <ul style="list-style-type: none"> a commercial, industrial, or multifamily site development, OR a redevelopment project proposing improvements to an existing commercial, industrial, or multifamily site . . . 	<p>THEN the project must provide water quality source controls applicable to the proposed project in accordance with the <i>King County Stormwater Pollution Control Manual</i> and King County Code 9.12.</p>

Application of this Requirement

When applicable, structural source control measures, such as car wash pads or dumpster area roofing, shall be shown on the site improvement plans submitted for engineering review and approval. Other nonstructural source control measures, such as covering storage piles with plastic or isolating areas where pollutants are used or stored, are to be implemented after occupancy and need not be addressed during the plan review process. All commercial and industrial projects (irrespective of size) undergoing drainage review are required to implement applicable source controls.

1.3.5 SPECIAL REQUIREMENT #5: OIL CONTROL

Projects proposing to develop or redevelop a high-use site (defined below) must provide oil controls in addition to any other water quality controls required by this manual. Such sites typically generate high concentrations of oil due to high traffic turnover or the frequent transfer of oil.

A **high-use site** is any one of the following:

- A commercial or industrial site subject to an expected average daily traffic (ADT) count equal to or greater than 100 vehicles per 1,000 square feet of gross building area, OR
- A commercial or industrial site subject to petroleum storage ~~and or~~ transfer in excess of 1,500 gallons per year, not including routinely delivered heating oil, OR
- A commercial or industrial site subject to use, storage, or maintenance of a fleet of 25 or more diesel vehicles that are over 10 tons gross weight (trucks, buses, trains, heavy equipment, etc.), OR
- A road intersection with a measured ADT count of 25,000 vehicles or more on the main roadway and 15,000 vehicles or more on any intersecting roadway, excluding projects proposing primarily pedestrian or bicycle use improvements.

The oil control requirement for high-use sites applies to all sites that generate high concentrations of oil, regardless of whether the project creates new impervious surface or makes site improvements to an existing high-use site. The traffic threshold identified focuses on vehicle turnover per square foot of building area (trip generation) rather than ADT alone. This is because oil leakage is greatest when engines are idling or cooling. In general, all-day parking areas are not intended to be captured by these thresholds except for diesel vehicles, which tend to leak oil more than non-diesel vehicles. The petroleum storage and transfer stipulation is intended to address regular transfer operations such as service stations, not occasional filling of heating oil tanks.

Threshold	Requirement
IF a proposed project either: <ul style="list-style-type: none"> • develops a site which will have high-use site characteristics (defined above), OR • is a redevelopment project proposing \$100,000 or more of improvements to an existing high-use site . . . 	THEN the project must treat runoff from the high-use portion of the site using oil control treatment options from the High-Use menu (described below and detailed in Chapter 6).

High-Use Menu

High-use oil control options are selected to capture and detain oil and associated pollutants. The goal of treatment is to have no visible sheen for runoff leaving the facility, or to have less than 10 mg/L total petroleum hydrocarbons (TPH), depending on the BMP. Oil control options include facilities that are small, handle only a limited site area, and require frequent maintenance, as well as facilities that treat larger areas and generally have less frequent maintenance needs. Facility choices include catch basin inserts, linear sand filters, and oil/water separators. See Chapter 6 for specific facility choices and design details.

Application of this Requirement

For high-use sites located within a larger commercial center, only the impervious surface associated with the high-use portion of the site is subject to treatment requirements. If common parking for multiple businesses is provided, treatment shall be applied to the number of parking stalls required for the high-use business only. However, if the treatment collection area also receives runoff from other areas, the treatment facility must be sized to treat all water passing through it.

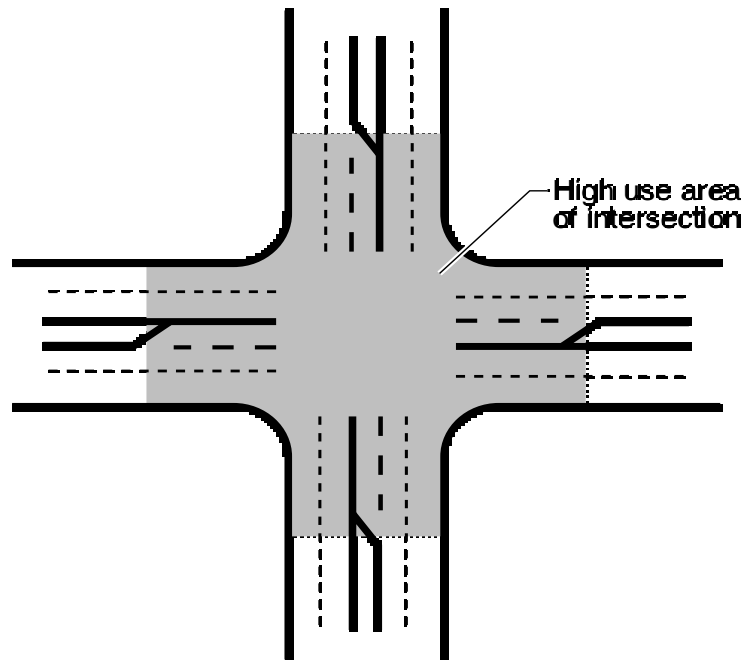
High-use roadway intersections shall treat lanes where vehicles accumulate during the signal cycle, including left and right turn lanes and through lanes, from the beginning of the left turn pocket (see Figure 1.3.5.A below). If no left turn pocket exists, the treatable area shall begin at a distance equal to three car-lengths from the stop line. If runoff from the intersection drains to more than two collection areas that do not combine within the intersection, treatment may be limited to any two of the collection areas.

Note: For oil control facilities to be located in public road right-of-way and maintained by King County, only coalescing plate or baffle oil/water separators shall be used unless otherwise approved by an adjustment.

Methods of Analysis

The traffic threshold for the High-Use menu shall be estimated using information from *Trip Generation*, published by the Institute of Transportation Engineers, or from a traffic study prepared by a professional engineer or transportation specialist with experience in traffic estimation.

FIGURE 1.3.5.A TREATABLE AREAS FOR HIGH-USE ROAD INTERSECTIONS



1.4 ADJUSTMENT PROCESS

For proposed projects subject to drainage review by the Department of Development and Environmental Services (DDES), this process is provided for the occasions when a project proponent desires to vary from one of the core or special requirements, or any other specific requirement or standard contained in this manual. Proposed adjustments should be approved prior to final permit approval, but they may be accepted up to the time King County approves final construction or accepts drainage facilities for maintenance. The adjustment application form (one standard form serves all types of adjustments) is included in Reference Section 8-J.

Types of Adjustments

To facilitate the adjustment process and timely review of adjustment proposals, the following types of adjustments are provided:

- **Standard Adjustments:** These are adjustments of the standards and requirements contained in the following chapters and sections of this manual:

- * Chapter 2, "Drainage Plan Submittal"
- * Chapter 4, "Conveyance System Analysis and Design"
- * Chapter 5, "Flow Control Design"
- * Appendix C, *Small Site Drainage Requirements* (detached)
- * Appendix D, *Erosion and Sediment Control Standards* (detached).

Requests for standard adjustments will be accepted only for permits pending approval or approved permits which have not yet expired.

- **Complex Adjustments:** Complex adjustments typically require more in-depth review because they deal with more complicated requirements or requirements that affect basic County policies or other agencies. These adjustments deviate from the requirements contained in the following chapters and sections of this manual:

- * Chapter 1, "Drainage Review and Requirements"
- * Chapter 3, "Hydrologic Analysis and Design"
- * Chapter 6, "Water Quality Design"
- * Appendix A, "Maintenance Standards"
- * Appendix B, "Master Drainage Plans".

Requests for complex adjustments will be accepted only for permits pending approval or approved permits which have not yet expired.

- **Preapplication Adjustments:** This type of adjustment may be requested when the applicant needs an adjustment decision to determine if a project is feasible or when the results are needed to determine if a project is viable before funding a full application. The approval of preapplication adjustments is tied by condition to the project proposal presented at a preapplication meeting with DDES.
- **Experimental Design Adjustments:** This type of adjustment is used for proposing new designs or methods that are not covered in this manual, that are not uniquely site specific, and that do not have sufficient data to establish functional equivalence.
- **Blanket Adjustments:** This type of adjustment may be established by the County based on approval of any of the above-mentioned adjustments. Blanket adjustments are usually based on previously approved adjustments that can be applied routinely or globally to all projects where appropriate. Blanket adjustments are also used to effect minor changes or corrections to manual design requirements or to add new designs and methodologies to this manual.

1.4.1 ADJUSTMENT AUTHORITY

The Department of Development and Environmental Services (DDES) shall have full authority to determine if and what type of adjustment is required for any proposed project subject to drainage review by DDES. The authority to grant adjustments for such projects is distributed as follows:

- DDES shall have full authority to approve or deny standard, complex, and preapplication adjustments.
- DNR shall have full authority to approve or deny experimental design adjustments.
- Both DDES and DNR must approve blanket adjustments.

At any time, this adjustment authority may be transferred between DDES and DNR through a memorandum or an amendment to this manual. This memorandum or amendment must include specific guidelines for deferral of adjustment authority.

1.4.2 CRITERIA FOR GRANTING ADJUSTMENTS

Adjustments to the requirements in this manual may be granted provided that granting the adjustment will achieve the following:

1. Produce a compensating or comparable result that is in the public interest, AND
2. Meet the objectives of safety, function, appearance, environmental protection, and maintainability based on sound engineering judgment.

Where it has been demonstrated that meeting the criteria for producing a compensating or comparable result will deny reasonable use of a property, the applicant shall produce the best practicable alternative as determined by the director of DDES. The director or his/her designee shall assess the case to affirm that denial of reasonable use would occur and to require the practicable alternative that best achieves the spirit and intent of the requirement. DDES staff shall provide recommendations to the director on the best practicable alternative to be required.

Granting any adjustment that would be in conflict with the requirements of any other King County department will require review and concurrence with that department.

Experimental Design Adjustments

Experimental design adjustments that request use of an experimental water quality facility or flow control facility will be approved by DNR on a limited basis if, upon evaluation, DNR agrees the following criteria are met:

1. The new design is likely to meet the identified target pollutant removal goal or flow control performance based on limited data and theoretical considerations, AND
2. Construction of the facility can, in practice, be successfully carried out, AND
3. Maintenance considerations are included in the design, and costs are not excessive or are born and reliably performed by the applicant or property owner, AND
4. A share of the cost of monitoring to determine facility performance is contributed by the applicant or property owner.

Conditions for approval of these adjustments may include a requirement for setting aside an extra area and posting a financial guarantee for construction of a conventional facility should the experimental facility fail. Once satisfactory operation of the experimental facility is verified, the set aside area could be developed and the financial guarantee released.

1.4.3 ADJUSTMENT APPLICATION PROCESS

Standard and Complex Adjustments

The application process for standard and complex adjustments is as follows:

- Requests for standard and complex adjustments will be accepted only for permits pending approval or approved permits which have not yet expired.
- The completed adjustment request application forms must be submitted to DDES along with sufficient engineering information (described in Chapter 2) to evaluate the request. The application shall note the specific requirement for which the adjustment is sought.
- If the adjustment request involves use of a previously unapproved construction material or construction practice, the applicant should submit documentation that includes, but is not limited to, a record of successful use by other agencies and/or evidence of meeting criteria for quality and performance, such as that for the American Association of State Highway and Transportation Officials (AASHTO) and the American Society of Testing and Materials (ASTM).
- A fee reduction may be requested if it is demonstrated that the adjustment request requires little or no engineering review.

Preapplication Adjustments

The application process is the same as for standard and complex adjustments except that requests will be accepted prior to permit application, but only if:

- The applicant provides justification at a preapplication meeting with DDES that an adjustment decision is needed to determine the viability of the proposed project, AND
- Sufficient engineering information to evaluate the request is provided.

Experimental Design Adjustments

The application process is the same as for standard and complex adjustments except that requests will be accepted prior to permit application.

Blanket Adjustments

There is no application process for blanket adjustments because they are initiated and issued solely by the County.

1.4.4 ADJUSTMENT REVIEW PROCESS

All adjustments are classified as Type 1 land use decisions in King County Code, Title 20, and as such, are governed by the review procedures and time lines set forth in KCC 20. Consistent with these procedures, the general steps of the review process for specific types of adjustments are presented as follows.

Standard and Complex Adjustments

- DDES staff will review the adjustment request application forms and documentation for completeness and inform the applicant in writing as to whether additional information is required from the applicant in order to complete the review. The applicant will also be informed if DDES determines that special technical support is required from DNR in cases where the adjustment involves a major policy issue or potentially impacts a DNR drainage facility.
- The Land Use Services Division Manager/designee or Building Services Division Manager/designee of DDES will review and either approve or deny the adjustment request following DDES's determination that all necessary information has been received from the applicant.

- Approvals of standard and complex adjustments will expire upon expiration of the permit to which they apply.

Preapplication Adjustments

The review process is the same as for standard and complex adjustments except that approvals will expire one year after the approval date, unless a complete permit application is submitted and accepted.

Experimental Design Adjustments

- DDES staff will refer requests for experimental design adjustments to DNR staff, along with any recommendations.
- DNR staff will review the submitted material and any DDES staff recommendations, and inform the applicant as to whether additional information is required in order to complete the review. DNR will also inform the applicant as to how much time is estimated to complete the review.
- The DNR director or designee will review and either approve or deny the adjustment request in writing.

Blanket Adjustments

Blanket adjustments will each be established by memorandum between DDES and DNR based on:

1. A previously approved standard, complex, preapplication, or experimental design adjustment and supporting documentation, AND
2. Information presenting the need for the blanket adjustment. Typically, blanket adjustments should apply globally to design or procedural requirements and be independent of site conditions.

Both DDES and DNR must approve a blanket adjustment.

1.4.5 APPEAL PROCEDURE

The applicant may appeal the denial or approval conditions of an adjustment request by submitting a formal letter to the director of the department in which the decision was made within 15 working days of the decision. This letter must include justification for review of the decision, along with a copy of the adjustment request with the conditions (if applicable) and a listing of all previously submitted material. The department director shall respond to the applicant in writing within 15 working days; this decision shall be final. A per-hour review fee will be charged to the applicant for County review of an appeal.